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Characterization and Disposal of Kaolinitic Slimes from Mining Operations

North Carolina State Univ. at Raleigh

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16. ABSTRACT

The waste of sand-and-gravel mines in piedmont North Carolina was characterized as to quantity, constituents, variability, and dewatering nature. Current disposal is by deep storage in ponds. The clay slimes, principally kaolinite, remain fluid indefinitely when stored deeper than two meters (7 feet). Alternative disposal schemes considered were thickening followed by filtration, vibration or disturbance of floccules, chemical additives, thickening followed by intermittent loading of two or more ponds, and thickening followed by drying in cells. An improvements of 50 percent in observed storage capacity was gained by means of thickening slimes to solids content of 250 g/l (22% by wt.) and loading intermittently two or more ponds such that drying of the upper crust took place between loadings. Observed storage volume required was reduced to 2.0 l/kg (1.5 acre feet per 1000 tons). Drying cells offer greater potential improvement. Slimes placed on the cells at less than two meters' depth (7 feet), may be expected to be drier than 1000 g/l (62% by wt.) after 13 weeks. The material may then by returned to the pit using ordinary earth-moving equipment. The method would avoid the need for high dams and new ponds but requires more handling and is sensitive to bad weather.

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by

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FOREWORD

When energy and material resources are extracted, processed, converted, and used, the related pollutional impacts on our environment and even on our health often require that new and increasingly more efficient pollution control methods be used. The Industrial Environmental Research Laboratory - Cincinnati (IERL-Ci) assists in developing and demonstrating new and improved methodologies that will meet these needs both efficiently and economically.

This report assesses the dewaterability of clay slimes from sand and gravel mining operations and investigates techniques to reduce the final volume of slimes produced. Slime handling techniques developed by this effort appear to be very effective in reducing final slime volumes as much as 30 percent. Results of this study should be of great importance to industry, which is faced with a lack of space to accommodate the solid waste volumes produced during the mining and processing of sand and gravel. For further information, please contact the Nonferrous Metals and Minerals Branch.

David G. Stephan
Director
Industrial Environmental Research Laboratory
Cincinnati

ABSTRACT

The waste of sand-and-gravel mines in piedmont North Carolina was characterized as to quantity, constituents, variability, and dewatering nature. Current disposal is by deep storage in ponds, typically requiring a volume of 2.9 l/kg (2.1 acre feet per 1000 tons) of dry slimes in the original ore. The clay slimes, principally kaolinite, remain fluid indefinitely when stored deeper than two meters (7 feet). Alternative disposal schemes considered were thickening followed by filtration, vibration or disturbance of floccules, chemical additives, thickening followed by intermittent loading of two or more ponds, and thickening followed by drying in cells.

Improvement of 50 percent in observed storage capacity was gained by means of thickening slimes to solids content of 250 g/l (22% by wt.) and loading intermittently two or more ponds such that drying of the upper crust took place between loadings. Observed storage volume required was reduced to 2.0 l/kg (1.5 acre feet per 1000 tons).

Drying cells offer greater potential improvement. Slimes placed on the cells at less than two meters' depth (7 feet), at initial solids content of 250 g/l (22% by wt.), may be expected to be drier than 1000 g/l (62% by wt.) after 13 weeks. The material may then be returned to the pit using ordinary earth-moving equipment. The method would avoid the need for high dams and new ponds but requires more handling and is sensitive to bad weather.

This report was submitted in fulfillment of Grant R803908 by North Carolina State University under the sponsorship of the U. S. Environmental Protection Agency. The report covers the period July 1, 1975, to August, 1980 at which time the work was completed.

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It was Mr. Craig McKenzie, formerly Chief, Land Quality Section of the N. C. Department of Natural Resources and Community Development, whose original idea it was that the research be undertaken.

SECTION 1

INTRODUCTION

In 1971, the General Assembly of North Carolina passed the State Mining Act. Since that time, sand-and-gravel mines have installed wash-water recirculation systems to avoid the discharge of fine particulates to the streams. Two problems have emerged. The first is that mines with ores having high clay contents have been accumulating clay slimes, at an alarming rate, estimated at more than 4.9×10^5 m^3/yr (400 acre-feet) per year in at least one case. The second problem is that the State Mining Act requires that these ponds be satisfactorily reclaimed on abandonment. The nature of the waste material is to remain fluid for periods exceeding twenty years, unless dewatered by some artificial means. Although the storage-volume requirement is not yet critical for many operations, the question of ultimate disposal of clay slimes is pertinent for all mines having ores containing clay. Further, the problem is not confined to North Carolina; it will exist generally as mining operations comply with the requirements of Public Law 92-500.

PROBLEM STATEMENT

The principal investigator conducted an exploratory investigation in the summer of 1974 to characterize the slimes-dewatering problem as to severity and potential for mitigation. Among the principal results was the finding that the required storage volume can be estimated at 3.4 l/kg (2.5 ac ft/1000 tons) of clay slimes in the ore. The clay content of the ore in the case study was 16 percent. Based on common ore unit weights, the wet slimes recovered from the process, even after some thickening, will occupy almost 90 percent of the volume of the original ore. The clear conclusion is that alternate methods for disposal of clay slimes are urgently needed, for although North Carolina mines are in compliance with effluent limitations now, there is a finite limit to their capacity to utilize current methodology. For many operations the limit is expected to be reached within two to five years.

Research into the general problem of dewatering slimes has been conducted in the coal industry and in the phosphate mining industry. The substance of that research is that economically efficient solutions probably exist either in thickening/filtration approaches (Akers, 1973) or in some variation on the use of ponds (Bureau of Mines, 1975). But no completely satisfactory system of slimes disposal has yet been found.

The writer is of the opinion that the low per-unit profit margin of the sand-and-gravel industry will preclude the adoption of schemes requiring high capital and operating costs. An independent investigation into slimes

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disposal in the sand-and-gravel industry was justified on two grounds: (1) that further research into the general subject of slimes disposal is warranted, and (2) that the tighter economic constraints imposed by market conditions prevailing in the sand-and-gravel industry reduce the flexibility of choice of the disposal system.

PROJECT OBJECTIVES

The objectives of the project were to seek more precise definition of the problem, to determine whether the improved operation and reclamation of recirculation ponds is feasible, and to seek alternative means of disposal of clay slimes.

Toward these concerns, the following six research objectives were proposed, given here as they were stated in the proposal:

1. To characterize the clay-slime dewatering problem. The results of preliminary studies indicate the need for determining the basic properties of the clay slimes and the extent to which these properties are likely to vary from mine to mine and from time to time. Of prime interest in this project are the long-term settling characteristics, filterability and the particle-surface chemistry. The variation of density of the settled material with depth and time in slime storage ponds is important.

2. To investigate methods for more efficient utilization of slime storage ponds. Storage ponds are the present means of choice for disposal of clay slimes. In the event that superior alternatives are not identified, improvement in the estimated storage volume requirement of 3.4 l/kg (2.5 ac ft/1000 tons) of clay slime is necessary. Preliminary indications show potential for reduction in storage requirement through intermittent pond loading, changes in the geometry of the loading pattern, the use of chemical additives, changes in the drainage of the supernatant, the use of subsurface drainage channels, or a combination of these.

3. To investigate methods for ultimate reclamation of storage ponds. Storage ponds in present use, and those used in the future, must be reclaimed according to law. Currently, the most promising avenue of research is to harden the surface of the pond to a shallow depth, and to establish compatible growth in the surface layer.

4. To investigate mechanical/chemical alternatives to ponds. Alternative means of dewatering clay slimes should be investigated. Most conventional and most promising of the alternatives for dewatering is thickening followed by filtration or centrifugation, with or without chemical addition. Of great concern is the economic efficiency of this set of alternatives, for the unit profit margin of the industry is characteristically low.

5. To investigate process modifications to minimize slime handling. The most attractive point of disposal of clay slimes is at the source of the ore, where it may be buried beneath the replaced overburden in the reclamation of mined-over areas. The principal barrier to disposal is the high cost of transporting the wet material from the processing plant to the ore source. Alternative schemes for minimizing the hauling of recovered slimes need investigation. Examples are the pretreatment of the ore at the source to remove the slimes, and the relocation of the processing plant in relation to the ore source. New requirements on slime recovery and increases in energy costs may have rendered decisions on process arrangement uneconomical.

6. To seek other treatment alternatives. The characterization phase of the project is intended to discover exploitable properties of the clay slimes. The investigators will be alert to the possibilities of treatment which emerge from the experimentation and from searches of the literature during the course of the project. Until characterization has proceeded significantly, full description of potential alternatives is not possible. Certainly, however, the investigation should not be limited to the treatment alternatives described in objectives two through five.

SUMMARY

Five sand-and-gravel mines were selected for diversity of size, nature of deposit, and operating policy. Basic data were collected for one year to characterize the operations and their wastes. Analyses were conducted to determine the quantity, mineral and chemical characteristics and variation of significant parameters with time. The principal constituent of all five wastes is kaolinite.

All the mines had recently employed simple storage of clay slimes at various depths as a disposal means. Samples were gathered from several storage ponds and analyzed for solids content as a function of depth.

Invariably, when the primary plant effluent is discharged into a quiescent container, the slimes flocculate and settle readily, leaving a clear supernatant almost free of contaminants. The settled slimes remain fluid indefinitely, even when stored at great depth.

Several alternative disposal schemes were considered and discarded. Thickening followed by filtration was rejected because of the large volume of waste to be handled, together with the high resistance to filtration, requires unreasonably large investments in filtration equipment. Vibration or other disturbance of the floc structure was rejected as a final disposal means, but it may be helpful if thickening is adopted as an intermediate treatment. Chemical additives were observed to have a pronounced effect on settling, thickening and filtration characteristics, but dose rates were too high to be economical.

Given that storage ponds have been used and are likely to continue to be used, ultimate reclamation of full storage ponds was considered. Ponds reclaimed as dry surfaces will likely require surface hardening treatments to cover liquid slimes. The best approach appears to be to reclaim slime ponds by establishing lakes above the stored slimes.

There appears to be no readily adaptable alternative to wet processing of sand and gravel at a central plant. Dry processing is not feasible, and pretreatment at the pit is uneconomical.

Improvements in pond storage efficiency may be obtained by using intermediate thickening followed by intermittent loading of two or more storage ponds with surface drying between loading cycles. Thickening is used to bring the slimes solids content to the range 150 to 250 g/l (14 to 22% by wt.); so that when discharged into the storage pond, a sloped surface will form to drain away supernatant and rain water. By careful management of the drainage system, the upper layers of slimes will give up water by evaporation and subsidence will occur. Although considerable rewetting takes place after subsequent flooding, the stored slimes are significantly denser than those stored continuously submerged.

The most promising alternative found is to use drying cells. Prethickened slimes are discharged onto drying beds at a depth of one to two meters (3 to 7 feet). After about 13 weeks of drying, evaporation will have reduced the depth by about 80 percent, and raised the solids content so that the slimes can be excavated with ordinary earth-moving equipment and returned to the pit. The drying-cell alternative makes it possible to avoid the use of large dams to store liquid slimes which are difficult to reclaim. The same land area can be used over and over. But additional operating expenses are incurred in removing the dried slimes to the pit, and effective operation of drying cells is very sensitive to bad weather. Full-scale test cells should be tested before an operation is converted to drying-cell disposal.

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SECTION 2

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The clay slimes observed as the waste from sand-and-gravel mining operations in piedmont North Carolina are composed principally of kaolinite. The quantity of slimes that will remain from a given ore can be estimated as the fraction of ore passing the #200 sieve.

On being discharged from the processing plant, the clay slimes flocculate and settle readily, leaving a clear supernatant almost free from contaminants.

The specific resistance to filtration of the clay slimes ranges from 2.0×10^8 to 3.5×10^8 s^2/g. The Lilesville clays (the more westerly sites) are at the lower end of the range.

Thickening followed by filtration was rejected as a dewatering scheme because the investment in equipment and the cost of operation would exceed that of simple storage.

Chemical addition is not needed to enhance settling characteristics. While polymer addition has a pronounced effect on resistance to filtration, the costs of that alternative remain excessive.

Vibrating the slime mass, or otherwise disturbing it to break up the floccules, accelerates dewatering in the range of solids content appropriate for thickening, but disturbance produces little increase in density beyond 400 g/l (32% by wt), at which solids content the slimes are still liquid.

Thickening may be effectively accomplished by discharging primary effluent, usually at solids content 25 to 60 g/l (2.5 to 6% by wt.) into a settling pond, and removing the slimes after compaction with a carefully operated dredge. Thickened slimes at 250 g/l (22% by wt.) have been observed to be routinely achievable.

Slimes stored continuously submerged were observed to attain an average solids content of approximately 375 g/l (20.5% by wt.) at one site and 410 g/l (32.7% by wt.) at another. Average solids content will vary directly with depth. It is reasonable to expect a range between 300 and 400 g/l and to take 350 g/l (29% by wt.) as an average for design. This converts to a planning estimate: allow 2.9 l/kg, or 2.1 acre-feet of pond storage for each 1000 tons of dry slimes in the ore.

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Improved pond storage capability can be gained by loading intermittently two or more storage ponds with thickened slimes. Between loadings a pond is to be managed such that its surface is drained of supernatant and rain water. Ponds so operated have been observed to attain an average solids content of 500 g/l (38% by wt.), a 40-percent improvement over submerged storage. The planning estimate of 2.0 l/kg, or 1.5 acre-feet of storage per 1000 tons of dry slimes, can be used for this case.

The most reasonable approach to reclaiming filled slime ponds is to establish an artificial lake deeper than wading depth above the slimes.

There are no reasonable alternatives to wet processing of sand and gravel. Dry processing is not feasible, and pretreatment at the pit is uneconomical.

The most promising alternative disposal scheme for clay slimes is to use drying cells. Cells may be loaded with thickened slimes to a depth of one to two meters (3 to 7 feet) and managed so as to keep the surface exposed to sun and wind for about 13 weeks. Solids content will have exceeded 1000 g/l (62% by wt.), and the dried slimes may be removed by ordinary earth-moving equipment and returned to the pit. Cells are reusable. Dikes contain the wet slimes. Large dams are not needed. Reclamation is straightforward. But additional material handling is required. Drying cells are very sensitive to extended bad weather.

RECOMMENDATIONS

A study should be made of full-scale drying cells operated through several seasons. Four cells should be constructed at full size. They should be loaded at three-month intervals.

Operating procedures should be developed and refined, including contingency procedures for enduring extended adverse weather conditions.

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SECTION 3

CHARACTERIZATION OF WASTE MATERIAL

PARTICIPATING MINES

Five mining operations were selected for detailed data collection and characterization. These are:

1. W. R. Bonsal Company
   Lilesville, NC
2. B. V. Hedrick Company
   Lilesville, NC
3. Becker Sand & Gravel Co.
   Field Plant
   near Lillington, NC
4. Becker Sand & Gravel Co.
   Senter Plant
   near Lillington, NC
5. Nello L. Teer Company
   Elliot Plant
   near Lillington, NC

These operations are sufficiently diverse in deposit, topography, method of operation and plant scale to characterize adequately the slimes disposal problem and to determine the conditions under which one of a variety of solutions might be best.

Briefly, the Lilesville mines are adjacent to each other in quite hilly terrain. Their slimes are very low in sand content. The Lillington mines are distributed along the Cape Fear River in considerably flatter terrain. Typically, their slimes include more wasted sand. Unlike the Lilesville operations, the Lillington plants are favorably located relative to mined-over deposits so that gravity flow can be used to transport the waste to a reclamation area.

BASIC DATA SET

At each of the five mines, data were gathered regularly for about one year. Samples were collected morning and afternoon of a sampling day. For each sample, the following were recorded or measured:

Date of sample collection
Time of sample collection (military clock)
Solids concentration of sample (grams per liter)
Sieve analysis (percent passing #10, #40, #200 sieves)
Settling analysis (five parameters of settling curve)
Specific resistance to filtration ($s^2/g \times 10^{-8}$)
Sample pH
Ore processing rate (tonne/day)

Daily maximum temperature (previous 24 hours)
Daily minimum temperature (previous 24 hours)
Wet-bulb temperature
Dry-bulb temperature
Sample temperature
Monthly accumulated rainfall
Plant operating time that day (hr)

LABORATORY TESTING PROCEDURES

Field samples were collected in 4-liter (1-gal) quantities. The less obvious parameters were obtained by these procedures.

A. Gradation Procedure

1. Draw off two 220 ml subsamples from a uniformly mixed two-gallon sample. Use a narrow neck overflow container for accuracy.

2. Transfer one subsample to 25-ml erlenmeyer flask using a wash bottle to ensure complete transfer.

   Transfer the other subsample to a preweighed 25-ml beaker, ensuring complete transfer, and set aside for measurement of total solids content (oven-dried weight).

3. Add 1 ml of 5% Calgon solution to contents in erlenmeyer flask, stopper and shake well.

4. Set up sieve series in a funnel located over sink and/or bucket.

5. Reshake suspension and transfer contents to top sieve and agitate particles with small stream of water.

6. Remove top sieve and agitate particles on next screem.

7. Repeat step 6 until the finer particles have passed the last sieve.

8. Transfer particles remaining on each sieve screen to a preweighed beaker by turning screen upside down in the funnel and rinsing screen and funnel with stream of water into beaker set under funnel.

9. Allow to oven dry at 105°C.

10. Cool in dessicator and weigh to nearest mg.

B. Particle Specific Weight Procedure (Adapted from Black, et al, 1965)

1. Collect a representative sample of approximately 600 ml and oven dry overnight.

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2. Weigh a clean, acetone dried 50-ml pycnometer including stopper.

3. Grind soil using rubber-tipped pestle and add approximately 10 grams to pycnometer.

4. Bring to full volume with distilled water and vacuum out entrapped air.

5. Refill completely with boiled distilled water cooled to room temperature, place the stopper, clean and dry the outside and weigh.

6. Determine temperature of contents.

7. Transfer particles completely to a beaker for determination of exact over-dried weight.

8. Refill clean pycnometer with cooled boiled water at temperature above and weigh.

Calculations:

$$\gamma_s = \frac{\gamma_{\omega(temp)}(W_{ps} - W_p)}{W_{pw} - W_p + W_{ps} - W_{sw}}$$

γ_s = specific weight solids

γ_ω = specific growth of water at temperature recorded

W_{ps} = weight of pycnometer + weight of solids

W_p = weight of pycnometer

W_{pw} = weight of pycnometer + weight of water

W_{sw} = weight of solids + weight of water

C. Settling Test Procedure

1. Place a 1000-ml representative sample of the suspension to be studied in a graduated cylinder.

2. Stir the sample vigorously with a perforated plunger for 10 or 15 seconds or until the suspension is well mixed. Wait 5 seconds after removing plunger to begin the test (0 min, 1000-ml interface height). The interface height should be recorded at time intervals similar to the following: 0, 5, 10, 20, 30, 45, 60, 75, 90 min, 2 hr, 3 hr, 4 hr, and 5 hr. These times are suggested and need not be followed exactly.

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Sufficient points are required to determine the initial and final linear portions of the curve. The data are as follows (See Figure 1):

S_1 = Slope of the initial linear portion of the curve

B_1 = Time when curve becomes nonlinear

S_2 = Slope of the final linear portion of the curve

I_2 = Intercept of final linear portion of the curve

B_2 = Time when curve becomes linear again

For some samples there will not be a distinct interface, and this curve cannot be obtained.

3. A useful procedure for running a large number of samples at once is as follows:

   a. Line up samples and prepare data sheets for entries.

   b. Set up a timing routine. Ex.: 20 samples. It will take 5 minutes if each sample is stirred for 15 seconds. If T (0 min., 1000 ml height) for sample #1 is to be 12:00, start stirring at 20 sec before 12:00 and stir for 15 sec, quickly switch and stir #2 for 15 sec, and continue down the line. Stirring should be complete for #20 at 12:04:40; therefore, T_o for #20 will be at 12:04:45. The T_{5min} reading for #1 will be at 12:05:00, 12:05:15 will be T_{5min} for #2 and so on down the line.

D. Filtration Test Procedure for the Determination of Specific Cake Resistance (Adapted from Coakley, 1958)

1. Take the settled slimes from the settling test and siphon off the clear supernatant to the 300 ml of the cylinder. If the suspension has not settled to this level, siphon down to the 400-ml mark. The concentration of the suspension is now equal to 3.3 or 2.5, respectively, times the concentration that was determined for the original suspension.

   In this concentrated form solids settle out slower, and there is less leakage around the filter paper when vacuum is first applied.

2. Two samples is the easiest number to run simultaneously.

   a. Set up system as shown in Figure 2.

   b. Place 1 circle of Whatman #3 filter paper in each of the Buchner funnels. Apply vacuum to the graduated cylinders

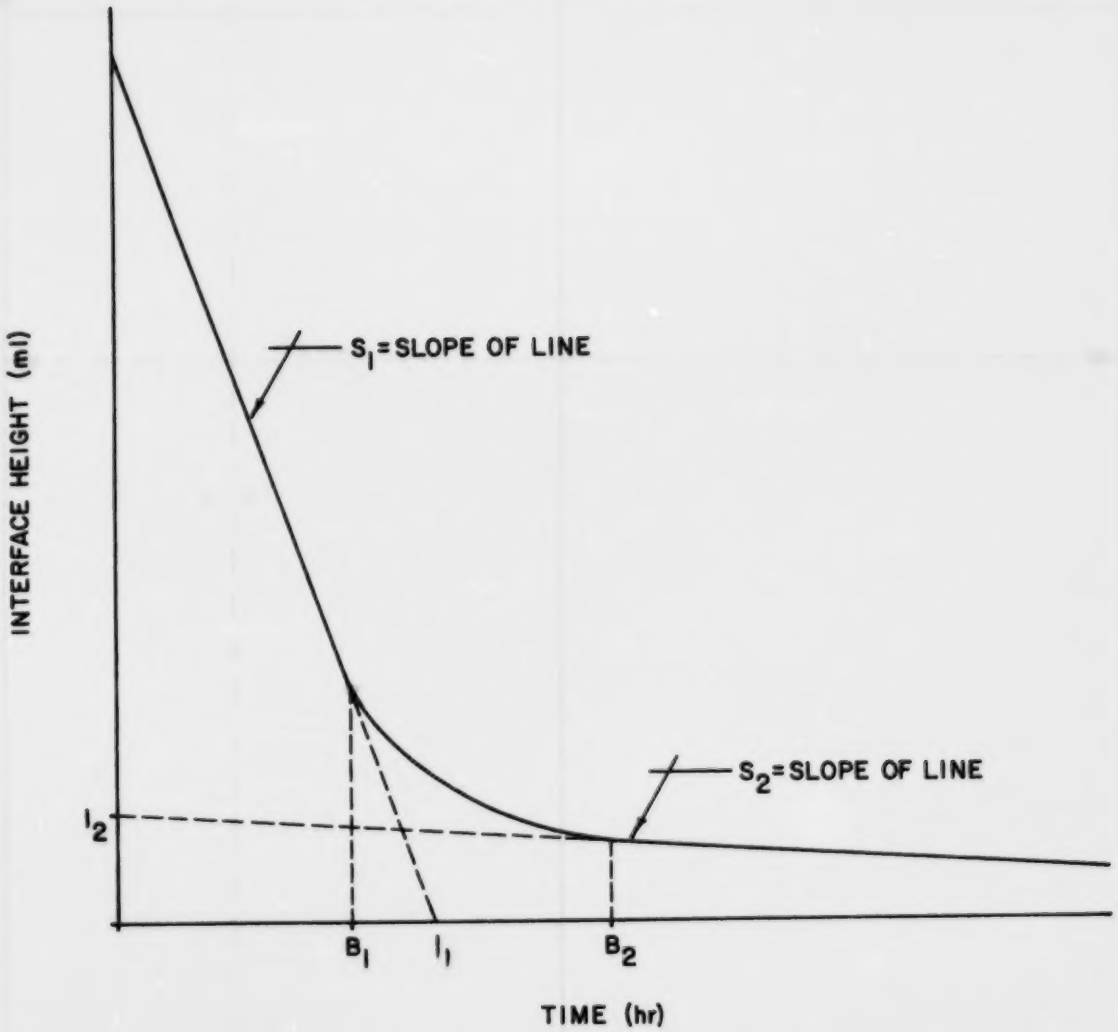

Figure 1. Definition sketch for settling parameters.

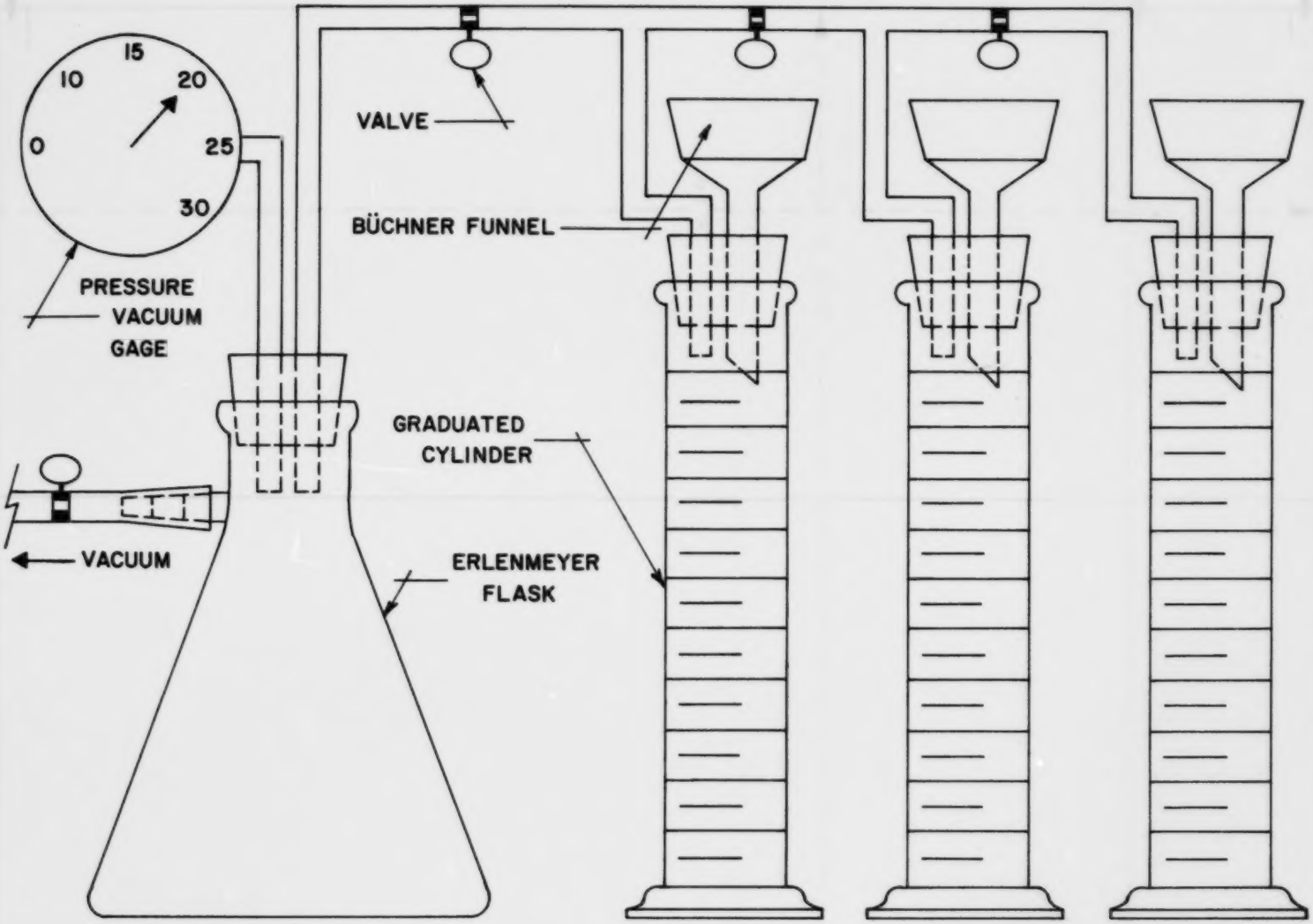

Figure 2. Filtration test apparatus.

and set the filter paper by wetting with water until the water level in the cylinders is at the zero mark.

c. Release vacuum from the cylinders and close them off from the system.

d. Increase vacuum in reservoir to 24-in Hg and close valve to aspiration.

e. Set timer to zero.

f. Stir each sample until well mixed and quickly pour approximately 200 ml of sample #1 into funnel #1, and approximately 200 ml of sample #2 into funnel #2.

g. Open cylinders to vacuum simultaneously and quickly start timer.

h. Adjust vacuum to 20-in Hg by adjusting aspiration valve and/or vent valve.

i. Enter the time and volume of filtrate for each sample every minute for 6 min.

3. The basic equation for calculation of specific resistance is

$$T/V = \frac{\mu\alpha\omega V}{2PA^2} + r/P$$

where
- V = volume of filtrate
- A = area of filter
- T = time
- P = pressure drop across filter and cake
- μ = viscosity of filtrate
- ω = mass of solids/volume of filtrate
- r = resistance due to filter
- α = specific resistance of filter cake

The data are plotted as T/V versus V yielding a straight line the slope of which given by

$$\text{slope} = \frac{\mu\alpha\omega}{2PA^2}$$

The slope, then, is measured from the T/V versus V plot, and specific resistance is computed as

$$\alpha = (2PA^2/\mu\omega) \cdot \text{slope}$$

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SUMMARY OF BASIC DATA

The complete set of basic data is listed in Appendix A. Selected parameters were analyzed and summarized in Table 1.

Samples were generally collected by plant personnel. Date, time, temperature and operating data were observed in the field by plant personnel. Sample containers and instruments were supplied as a part of the project and were the same at all sites. The samples were brought to the project laboratory for other analyses. It was intended that samples would be collected morning and afternoon three days per week. Weather and operating constraints frequently interfered with collection. During some periods samples were gathered more intensively. While some outliers exist, the data seem representative of the various operations.

Some comments on the various operations are of interest. The Hedrick mine personnel reported daily production and working hours as constants. The operating policy of Becker-Field and Becker-Senter was to reject sand-size particles as waste in order to meet product gradation specifications. Frequently, the waste streams at these sites contain so much sand that the analyses of the slimes were rendered invalid, especially resistance to filtration and solids content.

Settling curve analyses were found to provide little directly usable information. They were discontinued after a sufficient number were collected to characterize settleability. The slimes at these sites invariably settle with well-defined interface and clear supernatant. Initial settleability does not seem to be part of the problem.

The data are reasonable when cross-compared. Bonsal is the largest operation, Teer-Elliot the smallest. The Lilesville deposits behave similarly, as do the Lillington deposits. Operational differences show up between the two Lilesville operations in that Hedrick discharges more material in the plus-40 sieve range; and their discharge is more concentrated than Bonsal's. It should be noted, however, that Hedrick recovers fine sands from the slime ditch below the sampling point.

The two deposits, Lilesville and Lillington, are different in their resistance to filtration, the Lillington slimes being about 75 percent more resistant. It is thought that the specific resistance parameter is a good indicator of the tendency of the material to drain, or otherwise give up entrapped water. The Becker operations, Senter and Field, may in fact be overcoming the resistance to drainage through their policy of mixing sand rejects in their slimes. The Teer-Elliot operation does not do so. All three Lillington operations have surplus lands on which to dispose of slimes, so the difficulties associated with poor drainage behavior may not present themselves here until pond reclamation time.

TABLE 1. SUMMARY AND ANALYSIS OF OBSERVATIONS MADE OF CLAY SLIMES DURING PERIOD 1/1/76 - 12/31/76

Parameter	Bonsal	Hedrick	Senter	Field	Teer
Plant Location	Lilesville	Lilesville	Lillington	Lillington	Lillington
Solids Content (g/l)					
Mean	28.4	46.5	60.2	280.1[1]	21.9
Std. Deviation	11.4	20.8	43.2	278.1[1]	11.2
High	55.8	136.9	275.0	999.0	122.2
Low	7.1	7.9	4.2	5.5	4.2
% Passing #200 Sieve					
Mean	76.6	69.3	63.5	39.7	80.6
Std. Deviation	6.8	11.4	22.6	30.1	10.3
High	92.2	87.7	91.5	89.3	99.5
Low	50.7	0.2	0.1	0.1	24.9
Specific Resistance ($s^2/g \times 10^{-8}$)					
Mean	1.99	2.5	3.35	1.43[1]	3.58
Std. Deviation	0.65	0.67	1.86	0.70[1]	1.87
High	5.85	4.60	7.60	4.15	9.56
Low	0.65	0.46	0.40	0.05[1]	0.40
Ore Processing Rate (Tonne/day)					
Mean	5609	4536[2]	4621	3539	1835
Std. Deviation	980	-	1007	1008	365
High	7410	-	6985	4990	2670
Low	2833	-	2631	1950	660
pH					
Mean	4.91	4.87	5.51	5.8	5.96
Std. Deviation	0.43	0.40	0.38	0.61	0.62
High	6.6	6.90	6.6	7.1	9.6
Low	4.0	3.80	4.7	4.6	3.5
Washing Rate ($m^3/day \times 10^{-3}$)	29.0	20.5	-[3]	-[3]	-[3]
Average Operating Hours	9.2	10[2]	7.8	6.9	8.5

[1] These data are considered unreliable due to plant operating policies during sampling period.

[2] Given as constant.

[3] Not measured.

MINERALS ANALYSIS OF SLIMES

Slime samples from four operations were analyzed to determine:

1. Size distribution;
2. Mineral identification by X-ray diffraction;
3. Chemical analysis by wet chemical methods.

The following four mines were included in these studies:

1. Teer Elliot
2. Senter
3. Hedrick
4. Bonsal

As a first step towards determining the settling characteristics of slimes, both the plus 325 and minus 325-mesh fractions were treated separately. As received, the bulk sample was mixed thoroughly in a mixing tank and five samples of 500 ml each were drawn. Each of the 500 ml samples was dried in the oven at 110°C.

Size Distribution

Approximately 35-40 gm of the dry material was mixed thoroughly with water in 50-ml beaker. Plus 325-mesh particles were screened to remove coarse particles. The remaining fraction was used as a feed to the cyclosizer, which was operated using the standard conditions to separate the minus 325-mesh fraction into finer sizes. The same procedure was repeated on all four samples from the four mines. The data are shown on Table 2.

TABLE 2. SIZE DISTRIBUTION OF SLIME SAMPLES (% PASSING by wt.)

Size	Teer-Elliot	Senter	Hedrick	Bonsal
+325 Mesh	32.15	32.21	41.18	19.80
49.2 Micron	0.27	0.28	0.0	0.0
36.9 Micron	1.88	1.40	0.29	7.77
25.7 Micron	5.63	6.16	1.18	3.30
16.7 Micron	6.43	7.00	1.47	3.88
12.3 Micron	4.02	4.76	1.18	2.13
-12.3 Micron	49.62	48.19	53.52	63.12

It is evident from Table 2 that approximately 50 percent of the slimes is finer than approximately 12 microns. This indicates that colloidal-sized (minus 10-micron) particles form a major portion of the slimes and hence, they need to be treated separately. The stability of the slimes is attributed to these colloidal-sized clay particles.

X-Ray Diffraction Data

X-ray diffraction patterns of plus 325 and minus 325-mesh fractions were run with CuK-alpha radiation. The results were more conclusive for plus 325 mesh than for minus 325-mesh particles. A large portion of the plus 325-mesh fraction is silica (SiO_2) with trace amounts of other (clay and non-clay) minerals. On the other hand, kaolinite seems to be the clay mineral present in the minus 325-mesh fraction. Detailed analysis of X-ray diffraction patterns is given in Table 3.

TABLE 3. X-RAY DIFFRACTION RESULTS, PRIMARY MINERALS PRESENT

	+325 Mesh	-325 Mesh
TE (Teer Elliot)	SiO_2, anorthite	kaolinite, anorthite, mica, SiO_2
S (Senter)	SiO_2, anorthite Na-Al silicate, mica	kaolinite, SiO_2, mica, anorthite, Na-Al silicate
H (Hedrick)	SiO_2, kaolinite, mica	kaolinite, SiO_2, mica
B (Bonsal)	SiO_2, kaolinite, mica	kaolinite, SiO_2

Chemical Analysis

A chemical analysis of the plus 325 and minus 325-mesh fractions was obtained using analytical methods adopted by the Minerals Research Laboratory of North Carolina State University (Redeker, 1982). Results of the analysis are given in Table 4. By comparing the X-ray diffraction and chemical analysis data of plus 325 and minus 325-mesh fraction, it is seen that they are compatible. Silica (SiO_2) forms a major portion in the coarse fraction. Alumina (indicative of clay content) is concentrated in the minus 325-mesh fraction. Loss on ignition (indicative of clay content) of minus 325-mesh fraction is higher as compared to that of plus 325-mesh fraction.

TABLE 4. CHEMICAL ANALYSIS OF SOLIDS IN SLIMES

Description	LOI*	% Al_2O_2	% Fe_2O_3	% CaO	% MgO	% Na_2O	% K_2O	% TiO_2	% SiO_2
Bonsal, +325	2.6	7.1	3.4	0.04	0.04	0.07	0.54	0.54	85.8
Bonsal, -325	12.3	32.9	5.6	0.04	0.05	0.05	0.55	0.70	47.9
Hedrick, +325	1.6	4.7	3.0	0.04	0.03	0.06	0.71	0.70	89.1
Hedrick, -325	14.1	34.3	3.8	0.03	0.04	0.05	0.55	0.50	47.0
Senter, +325	0.93	11.8	1.6	1.8	0.04	2.8	1.8	0.34	78.7
Senter, -325	8.2	25.8	3.9	1.1	0.13	1.2	1.0	0.50	58.3
Teer, +325	0.47	10.3	2.1	1.3	0.14	2.3	1.4	0.38	81.7
Teer, +325	10.1	23.1	11.1	0.72	0.18	0.90	1.0	0.58	51.7

*Loss on Ignition @954°C.

Trace Contaminants in Clay Slimes Supernatant

A series of analytical tests was conducted to detect the presence and concentrations of several possible trace contaminants of clay slimes supernatant. These tests were conducted using an Atomic Absorption Unit and standard procedures of the American Public Health Association (APHA, 1971) and are represented by the data contained in Table 5. An examination of this table indicates that, of the substances tested, none are present in unusual or unexpected concentrations.

SAMPLING OF EXISTING SLIMES STORAGE PONDS

Core samples of existing slimes storage ponds were gathered and analyzed to determine the distribution of solids content with depth.

Procedure Used for Core Sampling of Slimes Ponds

Samples were taken in 38-mm (1.5-in) I.D. PVC pipe. The forward end was sharpened by bevelling. Wall thickness was 2.2 mm (0.086 m). The inside of the sampling tube was lubricated with petroleum jelly or wheel-bearing grease. The sampler was hand-driven in clay or hammered in sand. Sampler lengths of 2.5 m (8 ft) and 1.2 m (4 ft) were used at the Becker Field site. The apparatus was modified to accommodate lengths of 6 m (20 ft) at subsequent sites.

A piston suspended from a derrick remained stationary in the sampler during driving in order to provide a vacuum to minimize the quantity of material pushed ahead and away from the sampler. The apparatus was mounted on a raft. Sample locations were obtained by stadia observations.

TABLE 5. TRACE CONTAMINANTS OF CLAY SLIMES SUPERNATANT (mg/1)

Constituent	Mining Operation				
	Bonsal	Hedrick	T Elliot	Becker	Senter
Calcium - mg/1 Ca	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Magnesium - mg/1 Mg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sodium - mg/1 Na	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron, total - mg/1 Fe	0.00	0.01	0.01	0.01	0.01
Manganese, total - mg/1 Mn	0.05	0.05	0.05	0.05	0.05
Bicarbonate - mg/1 $CaCO_3$	0.00	0.00	0.00	0.00	0.00
Carbonate - mg/1 $CaCO_3$	0.00	0.00	0.00	0.00	0.00
Sulfate - mg/1 SO_4	0.00	0.00	0.00	0.00	0.00
Nitrate, total as N - mg/1 N	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
Phosphorus, total P - mg/1 P	< 0.02	< 0.02	< 0.02	< .02	< 0.02
Phosphorous, total as ortho - mg/1 P	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved solids as residue - mg/1	0.00	0.00	0.00	0.00	0.00
Total hardness as $CaCO_3$ - mg/1 $CaCO_3$	0.00	0.00	7.5	0.00	1.75
Noncarbonate hardness as CaCO - mg/1 $CaCO_3$	0.00	1.15	2.4	1.00	1.75
Alkalinity as $CaCO_3$ - mg/1 $CaCO_3$	0.00	1.15	9.9	1.00	1.75
Turbidity - Jackson Candle Units	< 25	< 25	< 25	< 25	< 25

Recovered samples were sealed at both ends, first with rubber stoppers, then with paraffin. Samples were brought to the laboratory for analysis and were extruded into a half-section of 1-1/2 inch nominal diameter PVC pipe (the next larger size for nesting). Extrusion was effected by moving the sample tube along a stationary piston. Care was taken neither to compress nor to extend the sample. Samples were raked transversely to reveal the deposition strata and to provide specimens at selected depth for solids-content analysis.

Several other sampling devices were evaluated for sampling and were found to be less satisfactory than the PVC pipe described. These were: shelby tube; stove pipe; larger PVC pipe; and augers. In using the larger devices, considerable center subsidence of the sample was observed on driving.

Sampling at the Becker Field Site

At the Becker Field site, eight vertical cores were obtained from the active slimes storage pond. The samples were collected along a line 367 m (1204 ft) in length parallel to the flow line from the discharge pipe to the flow outlet (See Figure 3). Sample depths ranged from 1.1 m (3.6 ft) to 3.6 m (11.8 ft).

The relationship of solids content to depth for each sample is tabulated in Table 6, and is shown graphically in Figure 4. The solids content ranged from 182 to 587 grams per liter, averaging 374 grams per liter. The average solids content converts to a storage requirement of 2.7 l/kg (2.0 acre-feet per 1000 tons of dry slimes), a value which compares favorably with a projection made in the proposal for this work. That projection was based upon an extrapolation of a 60-day settling test in a 2.5-m (8 ft) settling column.

Also of interest at the Becker Field site is the extent to which sand rejects mix with clay in the pond deposits. Indications from this sampling effort are that sands settle very close to the discharge point, while clays drift widely over the pond. Figure 5, the Boring Log, illustrates the distribution of sand and clay along a line from the discharge point to the outlet.

Sampling at the Hedrick Site

Core samples were obtained from the upper pond of the Hedrick operation in Lilesville, N.C., in the same manner. The pond had been in use since approximately the summer of 1974 and had been essentially full for about one year. Slimes flow through the pond and subsequently settle in a second pond just below.

The surface area of the pond was estimated to be 49000 m^2 (12 acres) while its capacity is approximately 247 x 10^3 m^3 (200 acre-feet) of slimes. The pond average depth was 5.2 m (17 ft). The maximum depth was 6.7 m (22 ft), based on a field survey of the newly constructed, empty pond conducted by plant personnel.

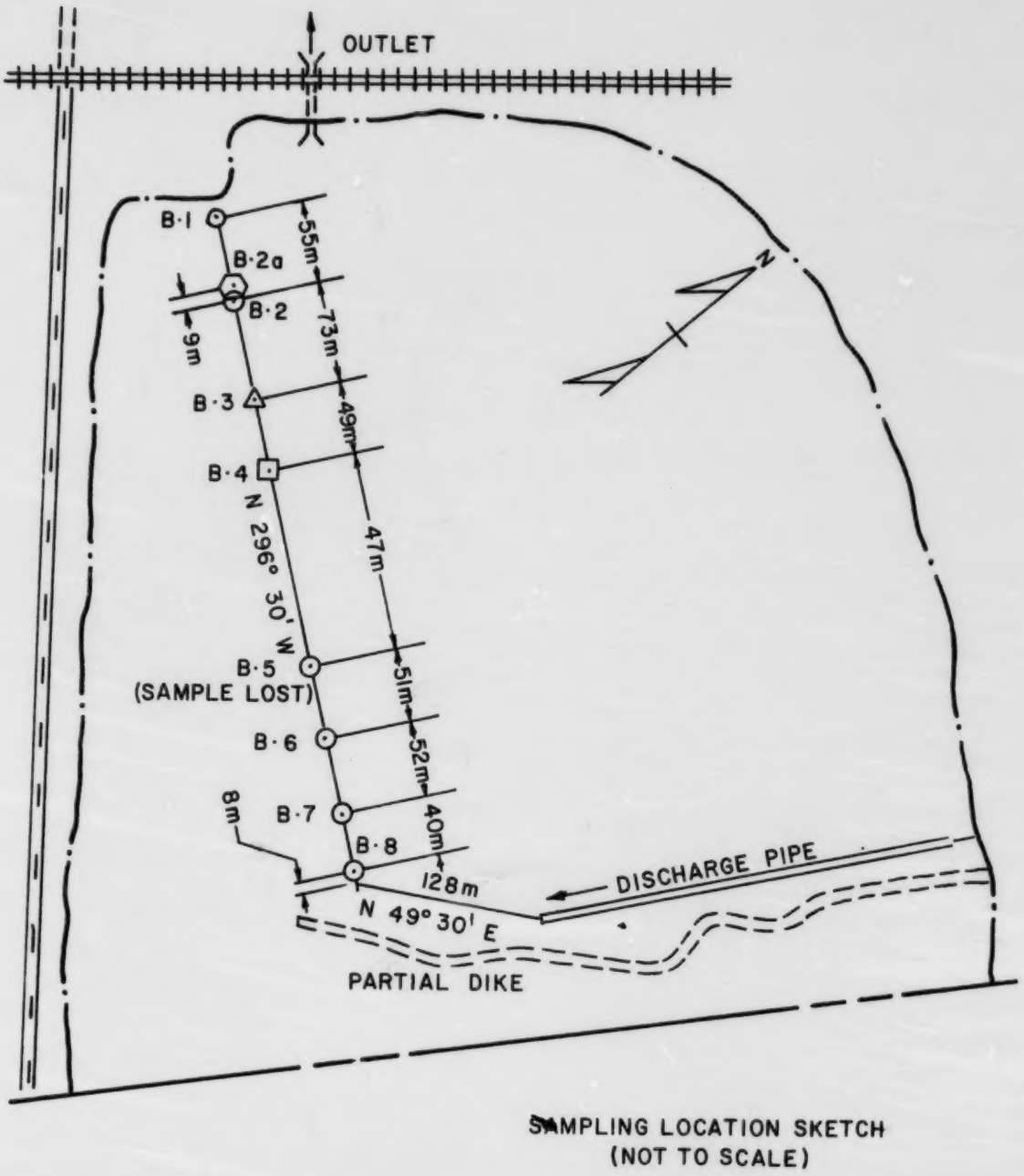

Figure 3. Schematic of Becker Field Plant slime pond.

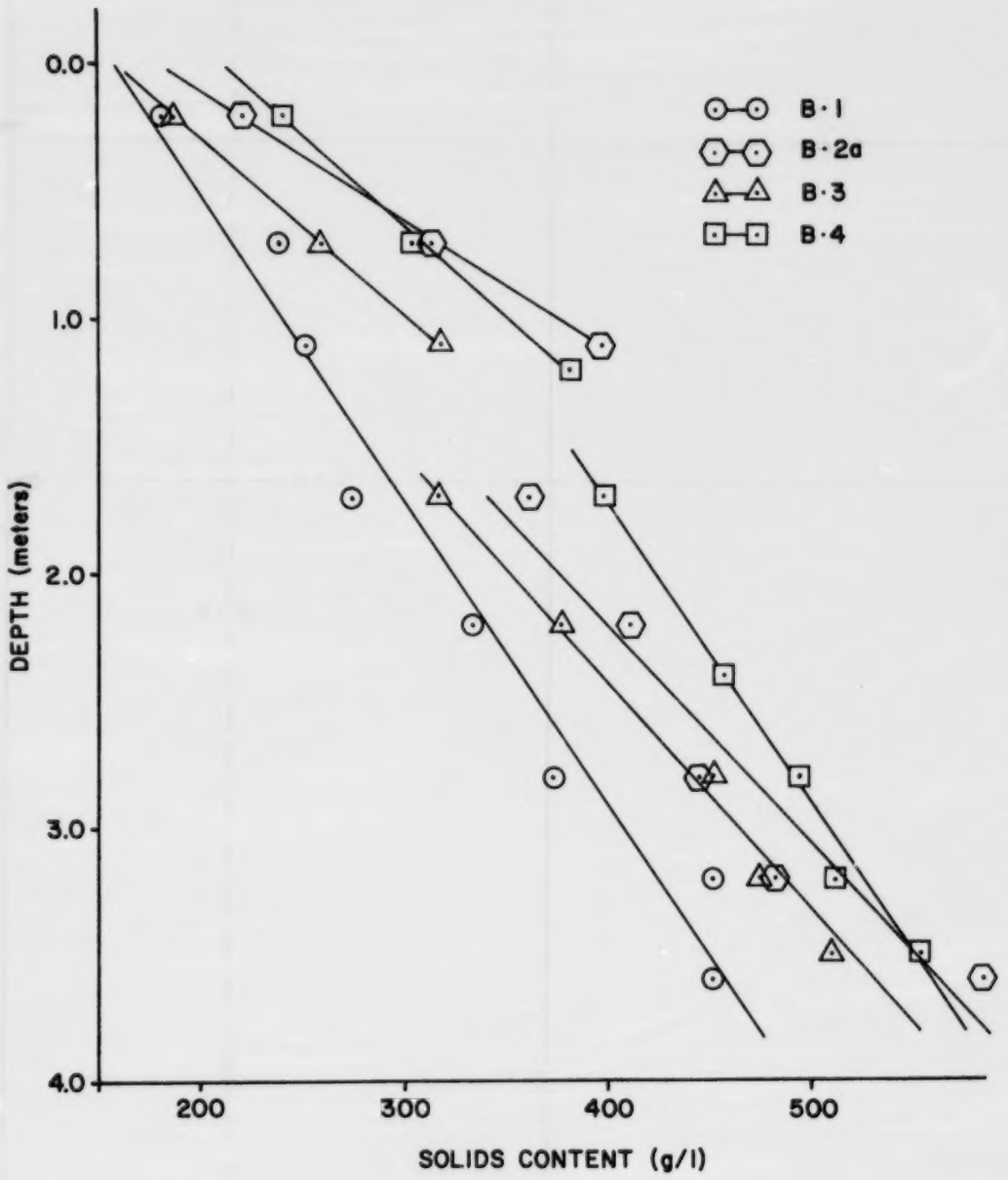

Figure 4. Solids content vs depth at Becker Field site.

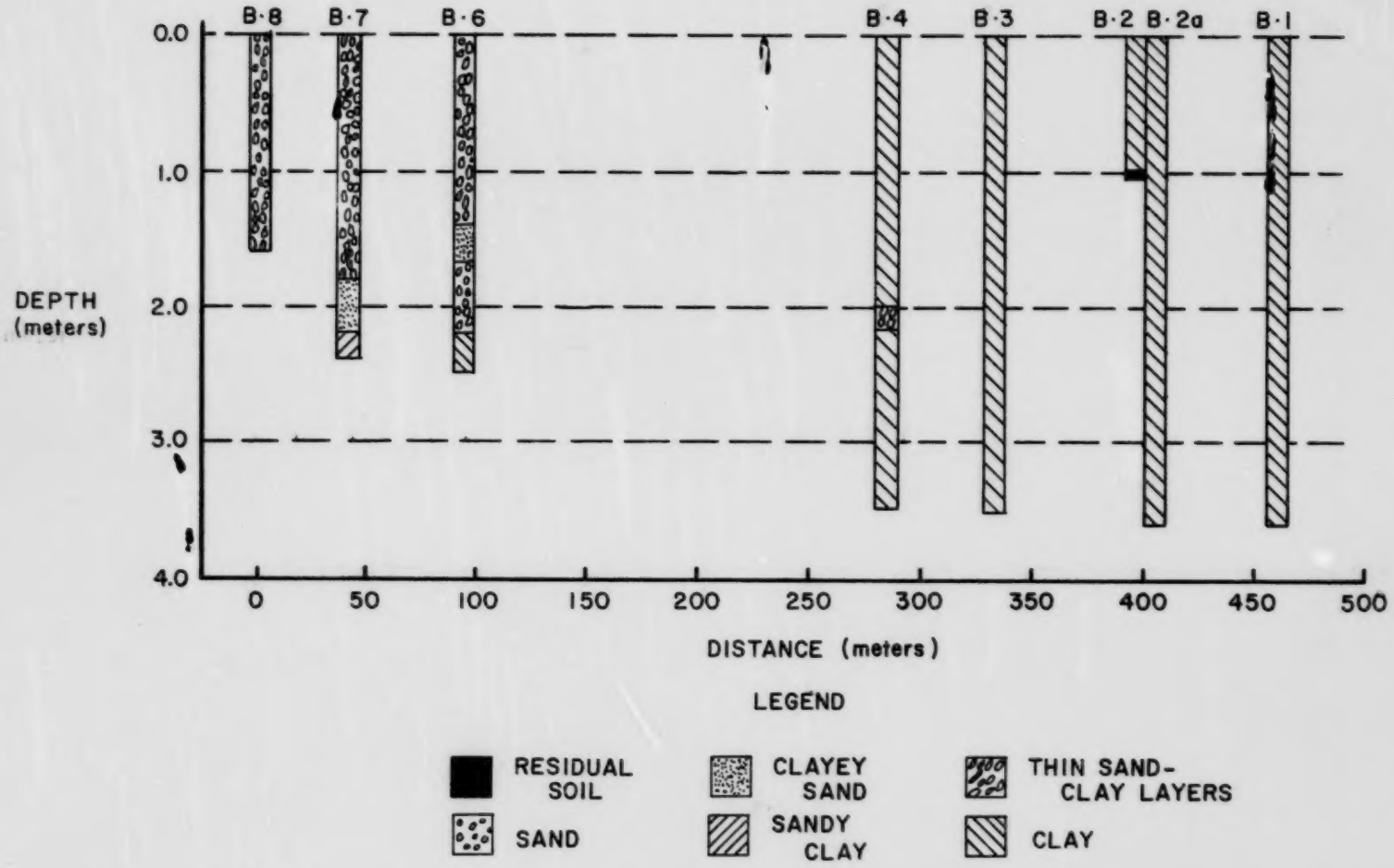

Figure 5. Boring log, Becker Field Plant slime pond.

TABLE 6. BORING DATA FROM BECKER FIELD SITE

Boring No.	Depth Meters	Water Content %	Solids Content g/Liter	Remarks
B-1	0.2	511	182	
	0.7	378	240	
	1.1	357	253	
	1.7	324	275	
	2.2	260	335	
	2.8	229	374	
	3.2	183	452	
	3.6	183	452	
B-2	0.2	383	237	
	0.7	184	450	
	1.0	045	1198	Residual soil
	1.0			Refusal (hard bottom)
B-2A	0.2	413	222	
	0.7	279	315	
	1.1	212	399	
	1.7	237	363	
	2.2	204	412	
	2.8	186	446	
	3.2	169	482	
	3.6	132	587	
B-3	0.2	497	187	
	0.7	344	261	
	1.1	275	319	
	1.7	277	317	
	2.2	227	377	
	2.8	183	452	
	3.2	172	475	
	3.5	153	522	
B-4	0.2	375	242	
	0.7	289	305	
	1.2	223	382	
	1.7	212	399	
	2.0-2.15	099	727	Sand layer
	2.4	180	458	
	2.8	164	494	
	3.2	157	512	
	3.5	142	554	

(continued)

TABLE 6 (continued)

Boring No.	Depth Meters	Water Content %	Solids Content g/Liter	Remarks
B-7	0.1	91.2	771	Sand
	0.25	26.2	1546	Sand
	0.5	34.7	1366	Sand
	1.1	66.5	953	Sand-Clay Layers
	1.4	79.4	848	Clay
	1.7	57.2	1045	Clay
	2.3	122.5	621	Clay
B-8	2.5	105.6	694	Clay
B-6	2.1	39.3	1286	Sandy Clay
	2.3	47.3	1165	Sandy Clay

The pond influent is kaolinitic slimes released at a flow rate of 20.5 x 10^3 m^3/day and at a solids content averaging 44 g/l. Before this material reaches the subject pond, the coarser fraction is recovered for the purpose of making a mortar sand.

The pond deposits were usually finer than 37 µm (the 200-mesh); however, some coarse sandy intrusions were found in the cores. This sand was either windblown or delivered to the pond during storm periods from the watershed of the stream which feeds the pond.

Samples were collected at the locations shown in Figure 6. Data on water and solids contents versus depth are presented in Table 7. These results are also shown graphically in Figures 7 through 9.

Using 75 observations of solids content at various depths, equally weighted, the mean solids content of the deposits was 411 g/l (560 tons/ac-ft or 0.35 tons/cu yd), which is denser than the observations taken at the Becker Field Plant. The difference is attributed largely to a depth effect, since this is the deeper deposit.

It should be noted that this solids content (400 g/l) is well below the estimated Atterburg liquid limit (800 g/l) and that these slimes behave as liquids. Other results support the expectation that they will remain so indefinitely. Thus, deposition of slimes in deep ponds should not be considered as the final step in disposing of slimes if pond reclamation is required.

The shape of the solids content vs depth curve from these data is of considerable interest. Previously, at Becker Field, solids content was observed to increase essentially linearly with depth. In the Hedrick

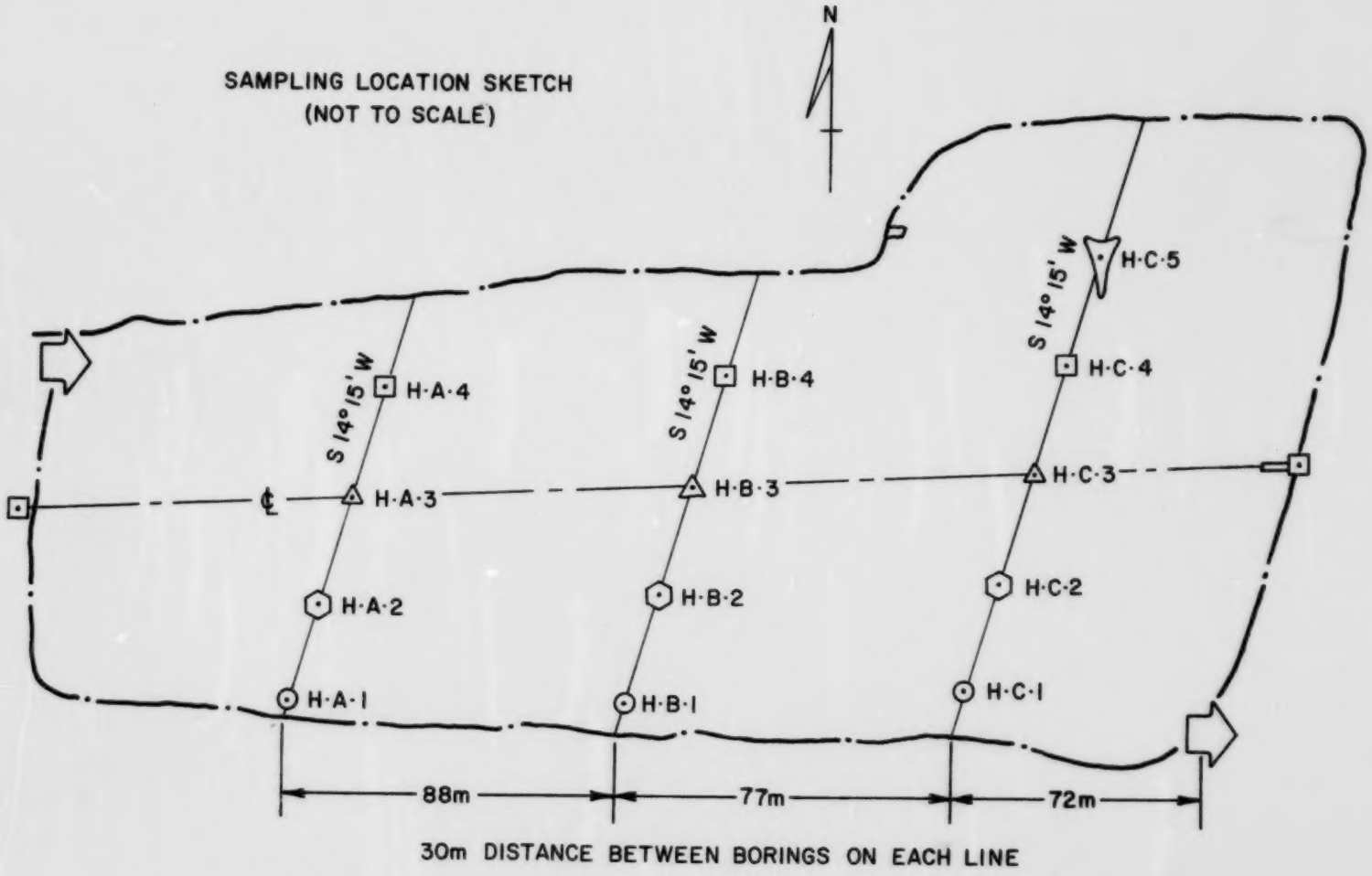

Figure 6. Schematic of Hedrick Plant slime pond.

TABLE 7. BORING DATA FROM B. V. HEDRICK SITE

Boring No.	Depth Meters	Water Content %	Solids Content g/Liter	Remarks
H-A-1	0.25	222	385	Length = 3.58m
	0.75	263	332	Recovery = 68%
	1.25	259	336	
	1.75	197	424	
	2.25	152	526	
	2.75	164	495	
	3.25	148	537	
	3.50	125	610	
H-A-2	0.25	236	365	Length = 4.19m
	0.75	267	327	Recovery = 76%
	1.25	282	312	
	1.75	258	337	
	2.25	222	384	
	2.75	200	419	
	3.25	136	572	
	3.75	138	566	
	4.10	127	606	
H-A-3	0.25	185	447	Length = 3.40m
	0.75	249	348	
	1.25	191	435	
	1.80	91.3	771	
	2.25	92.5	763	
	2.75	112	666	
	3.25	113	458	
H-A-4	0.25	154	520	Length = 2.51m
	0.75	203	415	Recovery = 63%
	1.25	179	459	
	1.75	142	553	
	2.15	125	611	Residual Soil at 2.24m
H-B-1	0.25	225	379	Length = 4.00m
	0.75	213	397	Recovery = 73%
	1.25	247	351	
	1.75	223	383	
	2.25	209	404	
	2.75	110	673	
	3.50	145	545	
	3.75	155	517	

(continued)

TABLE 7 (continued)

Boring No.	Depth Meters	Water Content %	Solids Content g/Liter	Remarks
H-B-2	0.25	238	361	Length = 4.67m
	0.75	283	311	Recovery = 85%
	1.25	263	332	
	1.75	246	352	
	2.25	226	378	
	2.75	224	380	
	3.25	152	524	
	3.75	186	446	
	4.25	146	543	
	4.60	136	572	
H-B-3	0.25	260	335	Length = 4.29m
	0.75	262	332	Recovery = 78%
	1.25	261	334	
	1.75	230	373	
	2.25	213	398	
	2.75	183	452	
	3.25	148	536	
	3.75	160	503	
	4.25	149	534	
H-B-4	0.25	225	380	Length = 4.22m
	0.75	259	336	Recovery = 77%
	1.25	276	318	
	1.75	223	382	
	2.25	200	420	
	2.75	211	400	
H-C-1	0.25	220	386	Length = 3.86m
	0.75	224	380	Recovery = 72%
	1.25	241	357	
	1.75	205	410	
	2.25	136	574	
	2.70	101	715	Refusal
H-C-2	0.25	238	362	Length = 4.44m
	0.75	245	353	Recovery = 87%
	1.25	251	345	
	1.75	260	335	
	2.25	227	377	
	2.75	196	427	
	3.25	182	453	
	3.75	127	605	
	4.25	117	642	
	4.40	123	619	

(continued)

TABLE 7 (continued)

Boring No.	Depth Meters	Water Content %	Solids Content g/Liter	Remarks
H-C-3	0.25	244	354	Length = 4.47m
	0.75	245	352	Recovery = 88%
	1.25	247	351	
	1.75	213	397	
	2.25	245	353	
	2.75	206	410	
	3.25	182	453	
	3.75	148	535	
	4.25	116	647	
H-C-4	0.25	228	375	Length = 4.37m
	0.75	300	295	Recovery = 86%
	1.25	253	344	
	1.75	208	406	
	2.25	241	358	
	2.75	225	380	
	3.25	173	473	
	3.75	174	472	
H-C-5	0.25	318	281	
	0.75	293	302	
	1.25	295	300	
	1.75	260	335	
	2.25	255	341	
	2.75	243	355	
	3.25	233	369	
	3.75	177	464	
	4.25	140	559	
	4.75	129	598	

deposits, there is an upper region where the solids content is higher near the surface than that at greater depths. Furthermore, there is a region of minimum solids content, typically at one meter (3.3 ft) depth, below which solids content increases with depth as before.

There is the suggestion that the difference is due to capillary and evaporative activity. The Becker Field slimes are continuously flooded, whereas the Hedrick slimes are periodically exposed to the atmosphere as water in the pond rises and falls with the pumping schedule. There is also reason to believe that some deposits are exposed for long periods of time.

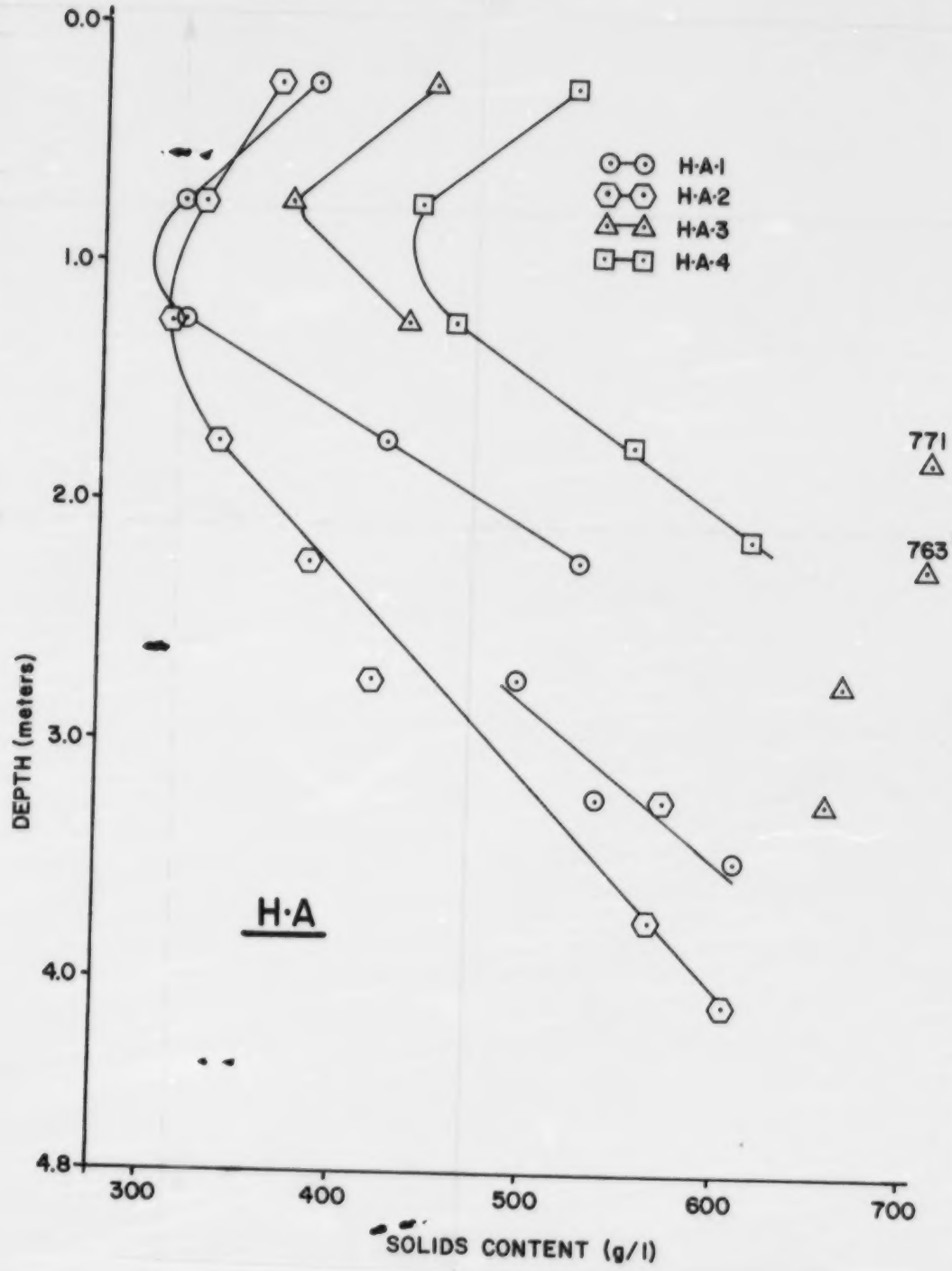

Figure 7. Solids content vs depth at Hedrick site.

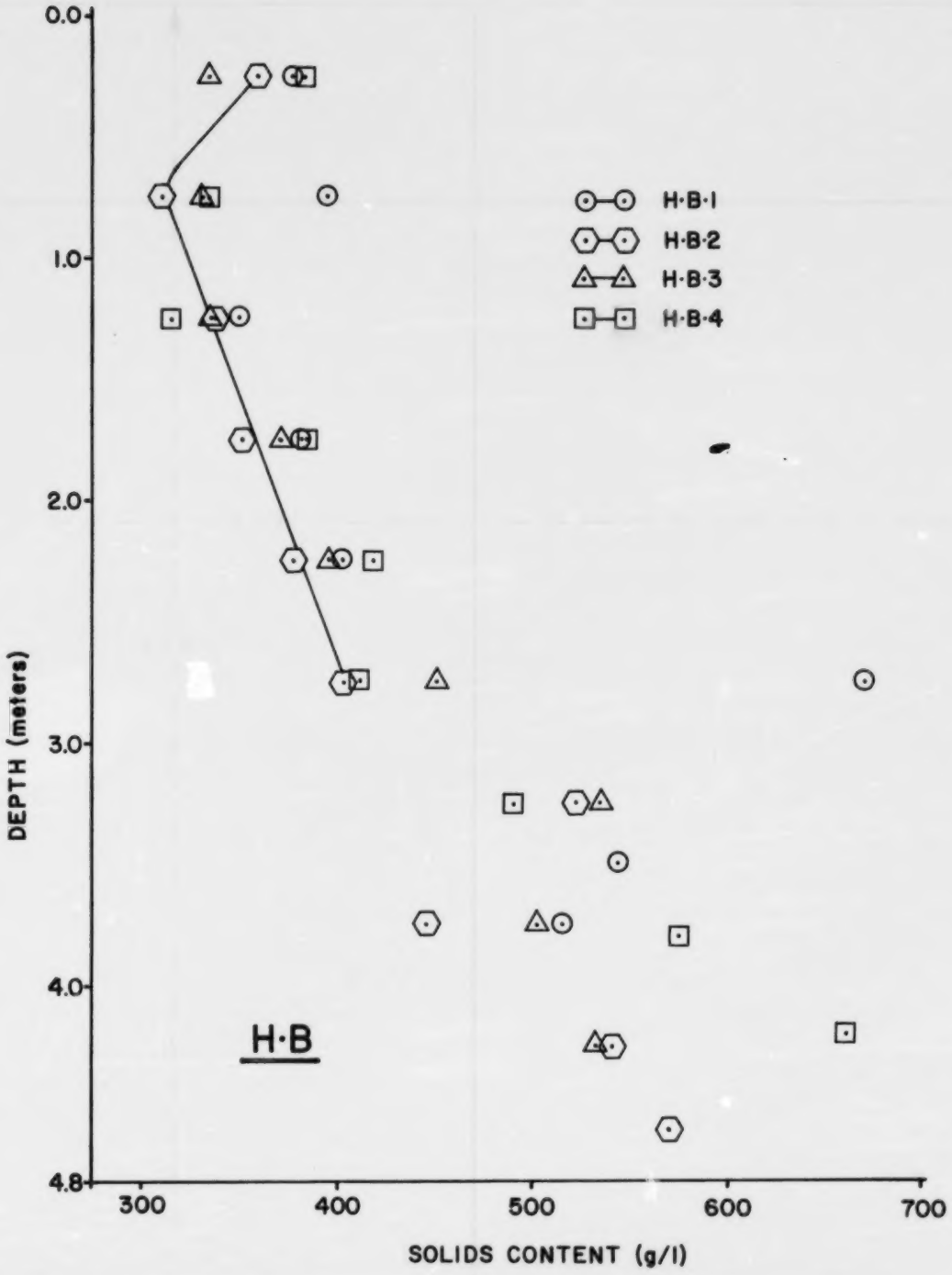

Figure 8. Solids content vs depth at Hedrick site.

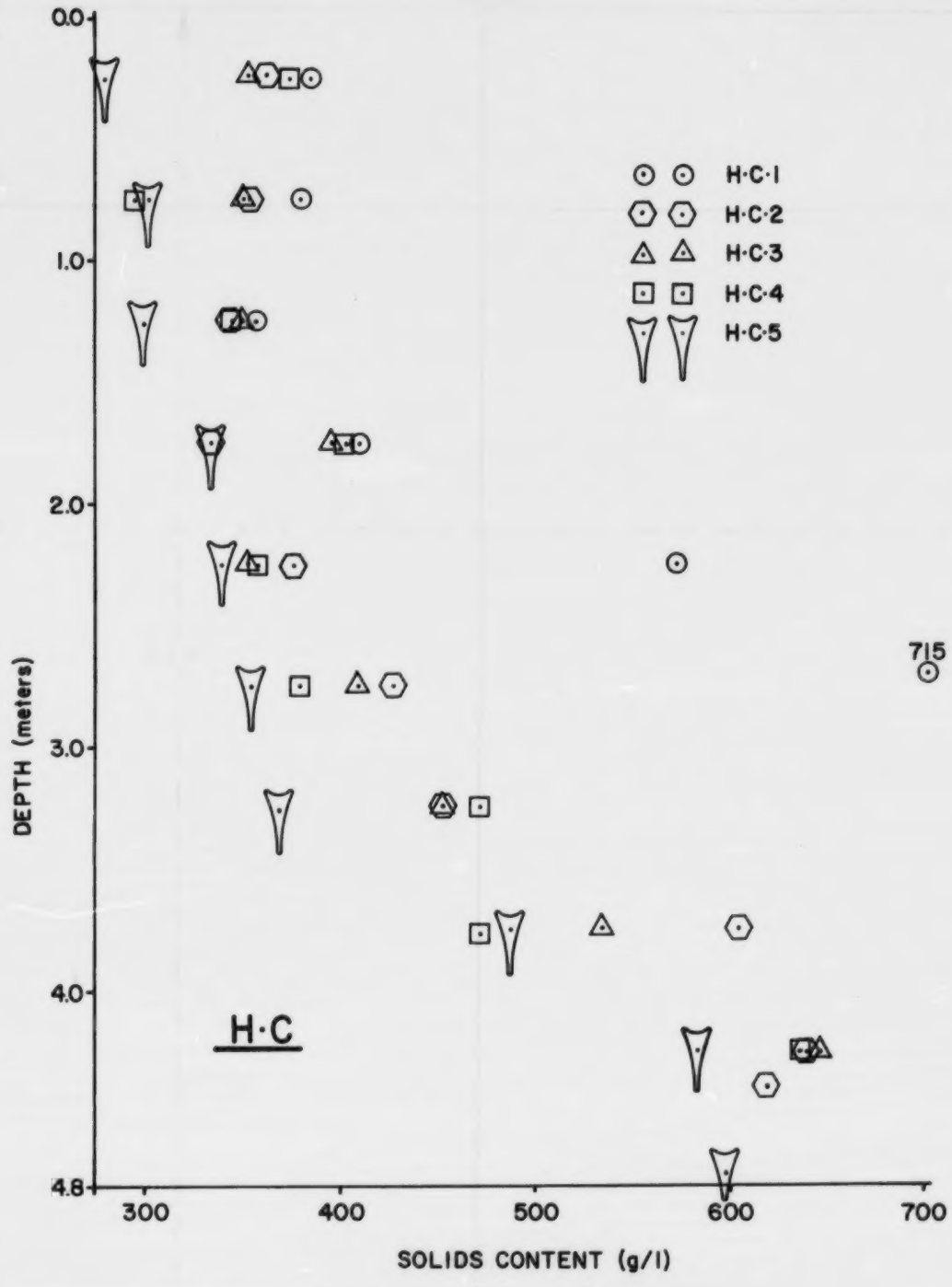

Figure 9. Solids content vs depth at Hedrick site.

SECTION 4

IMPROVEMENT OF POND OPERATION

Typically, slime-storage ponds have been operated with water depth being at or near the maximum depth of the pond. Deep water storage slimes cause the settled slimes to dewater only to approximately 300 g/l (25% by wt). For better utilization of pond storage volume, and for reasonable reclamation or transportation of waste slimes, solids content should be dryer than the Atterberg Liquid Limit, near 800 g/l (54% by wt).

INTERMEDIATE THICKENING POND

Conceptual improvements on simple pond storage include thickening slimes before delivery to storage. One of the participating plants, W. R. Bonsal, now operates a three-pond system. The first, a small pond, serves as a simple settling device, providing the process water source for the plant. A dredge delivers the thickened bottom deposits to a storage pond. Solids content of the slimes increases from 30 to 100 g/l (3 to 9% by wt) through this facility. Lately, they have been trying to achieve an effluent solids content of 250 g/l (25% by wt) by improving dredge operation. This material is delivered to one of two ponds.

The settling pond removes two-thirds or more of the water from the slimes and makes it available for reuse, thus conserving water. Less waste volume is pumped to storage. The higher the solids content of the material placed in the storage pond, the better the behavior of the slimes in storage.

INTERMITTENT LOADING OF STORAGE PONDS

Bonsal has instituted a system of alternate loading of two storage ponds. By loading the thickened effluent into the storage pond a deposit is built at the discharge point such that free water and rain water are drained from the surface. Careful management of the drainage system keeps the surface exposed as much as possible. After a time, usually three months, the discharge is switched to the other pond, and the first is allowed to dry. Large surface cracking indicates considerable drying action to be taking place. Much surface subsidence is noted.

In the upper meter of depth, where the cracking takes place, solids contents are observed repeatedly at 1200 g/l (70% by wt) after about three months of drying. This gives rise to the notion that drying cells may be an effective alternative, as developed more fully later in the report.

The keys to success of the intermittent loading scheme are to achieve the highest possible initial solids content at placement in the storage pond, to provide a drainage system to keep the surface of settled slimes exposed, and to drain away rain water effectively and rapidly.

Borings were taken in the two Bonsal storage ponds after two or three loading cycles. Table 8 shows the results of four borings in the smaller of the two ponds; Table 9 shows those from the larger. Figures 10 and 11 show graphically the depth vs solids content results.

The hardened strata, which were earlier surface layers, are discernible in both Figures 10 and 11, but more clearly in the large pond. These solids-content measurements were considered as outliers in statistical analysis of the results, for they represent quite thin strata in the stored mass. For each boring, the data are rather scattered, but the lines of best fit, obtained by linear regression, do show a tendency for solids content to increase with depth as expected.

Of interest is the observation that considerable rewetting of lower strata apparently takes place when dried deposits are flooded with fresh slimes. At the end of a drying cycle, the slimes have cracked and hardened to a depth of over one meter. One can walk on the dried surface without sinking. These results show that the residual hard layer (an old surface subsequently flooded) is typically 0.05 meters thick (about 2 in).

In general, a pond loaded intermittently tends toward a more uniform solids content with depth (compare Figures 10 and 4). The net benefit of intermittent loading may be estimated by using the overall average solids content in the pond. For these data, again casting out the crusty outliers, the overall solids content of the larger pond was 520 g/l (40% by wt, or 700 tons per acre-foot). The overall solids content for the smaller pond 480 g/l (27% by wt, or 650 tons per acre-foot). These compare to the ordinary deep storage estimates of approximately 375 g/l at the Field site and 400 g/l at the nearby Hedrick site.

For practical purposes, ordinary deep storage of slimes will average 300 to 400 g/l, depending upon the depth, with 350 g/l being a good average. Carefully managed intermittently loaded ponds will average 500 g/l. These convert to planning figures for estimating volume requirements. Allow 2.9 l/kg, or 2.1 acre-feet of storage for each 1000 tons of dry slimes for ordinary deep storage. Allow 2.0 l/kg, or 1.5 acre-feet of storage for each 1000 tons of dry slimes for intermittently loaded and dried ponds. (In the ore, the slimes may be estimated as the percent of ore passing the #200 sieve. The production rate may be used to estimate the weight of slimes to be expected in a given period.)

Intermittent loading can result in a 40 percent improvement in the slime storage volume requirement.

TABLE 8. BORING DATA FOR THE LARGER BONSAL POND

Boring No.	Depth, meters	Water Content, %	Solids Content, g/liter	Remarks
BO-1	0.3	194	431	
	0.8	120	632*	Hard layer
	1.0	174	471	
	1.3	168	484	
	1.6	102	711*	Hard layer
	2.0	173	474	
	2.2	98	734*	Hard layer
	2.5	151	529	
	3.0	166	488	
	3.5	167	486	
	3.9	178	461	
	4.4	145	546	
	4.9	174	471	
	5.4	161	501	
BO-2	0.3	213	398	
	0.75	113	662*	Hard layer
	1.0	184	449	
	1.25	102	714*	Hard layer
	1.5	189	440	
	1.9	160	503	
	2.2	116	649*	Hard layer
	2.5	148	536	
	3.0	137	571	
	3.5	175	469	
	3.7	177	464	
	4.5	165	491	
	5.1	133	585	
	5.6	151	527	
BO-3	0.3	156	514	
	0.8	127	605*	Hard layer
	1.0	161	502	
	1.4	89	787*	
	1.5	156	515	
	1.9	168	483	
	2.5	161	502	
	3.0	139	563	
	3.5	170	480	
	3.8	172	476	
	4.5	232	370	
	5.1	142	554	
	5.6	136	574	

(continued)

TABLE 8 (continued)

Boring No.	Depth, meters	Water content, %	Solids Content, g/liter	Remarks
BO-4	0.4	184	449	
	0.9	115	651*	Hard layer
	1.0	166	488	
	1.4	100	722*	Hard layer
	1.9	149	534	
	2.35	-	- *	Hard layer
	2.5	124	615	
	3.0	140	559	
	3.2	123	620	
	4.5	131	590	
	5.1	95	748	
	5.6	85	810	

TABLE 9. BORING DATA, BONSAL SMALLER POND

Boring No.	Depth, meters	Water content, %	Solids Content g/liter	Remarks
BO-5	0.5	224	382	
	1.2	211	401	
	1.7	95	749*	Hard layer
	1.8	178	462	
	2.4	156	514	
	3.1	128	601	
	3.7	125	613	
	4.2	123	621	
	4.6	112	666	
	4.9	95	748*	Refusal
BO-6	0.6	172	474	
	1.5	254	342	
	2.0	113	659*	Hard layer
	2.3	179	459	
	3.1	169	482	
	3.6	166	489	
	4.1	142	555	
	4.7	143	550	Narrow Hard Layer
	5.2	128	600	at 4.0 m.
	5.6	122	622	

(continued)

TABLE 9 (continued)

Boring No.	Depth, meters	Water content, %	Solids Content, g/liter	Remarks
BO-7	0.6	272	322	
	1.4	284	310	
	2.0	118	639*	Hard layer
	2.1	204	413	
	2.6	134	580*	Hard layer
	2.8	214	397	
	3.6	158	508	
	4.1	158	509	
	4.7	165	491	
	5.2	149	534	
	5.7	114	656	
BO-8	0.4	247	351	
	1.0	313	284	
	1.5	250	347	
	2.0	179	460	
	2.5	194	430	
	3.0	185	447	
	3.2	123	618*	Hard layer
	3.5	184	450	
	4.1	195	429	
	4.7	185	447	
	5.2	163	496	
	5.7	155	518	

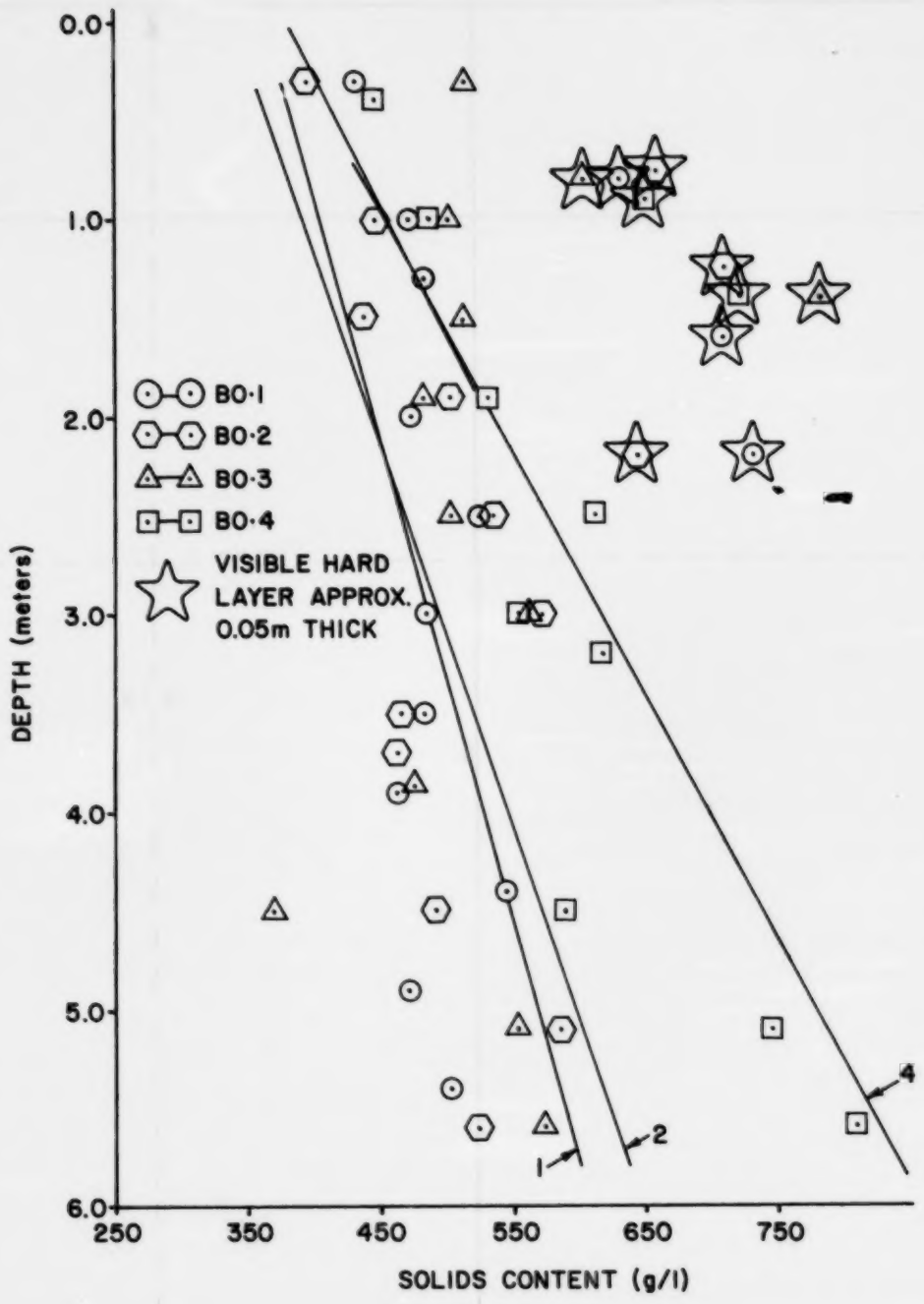

Figure 10. Solids content vs depth at Bonsal site--large pond.

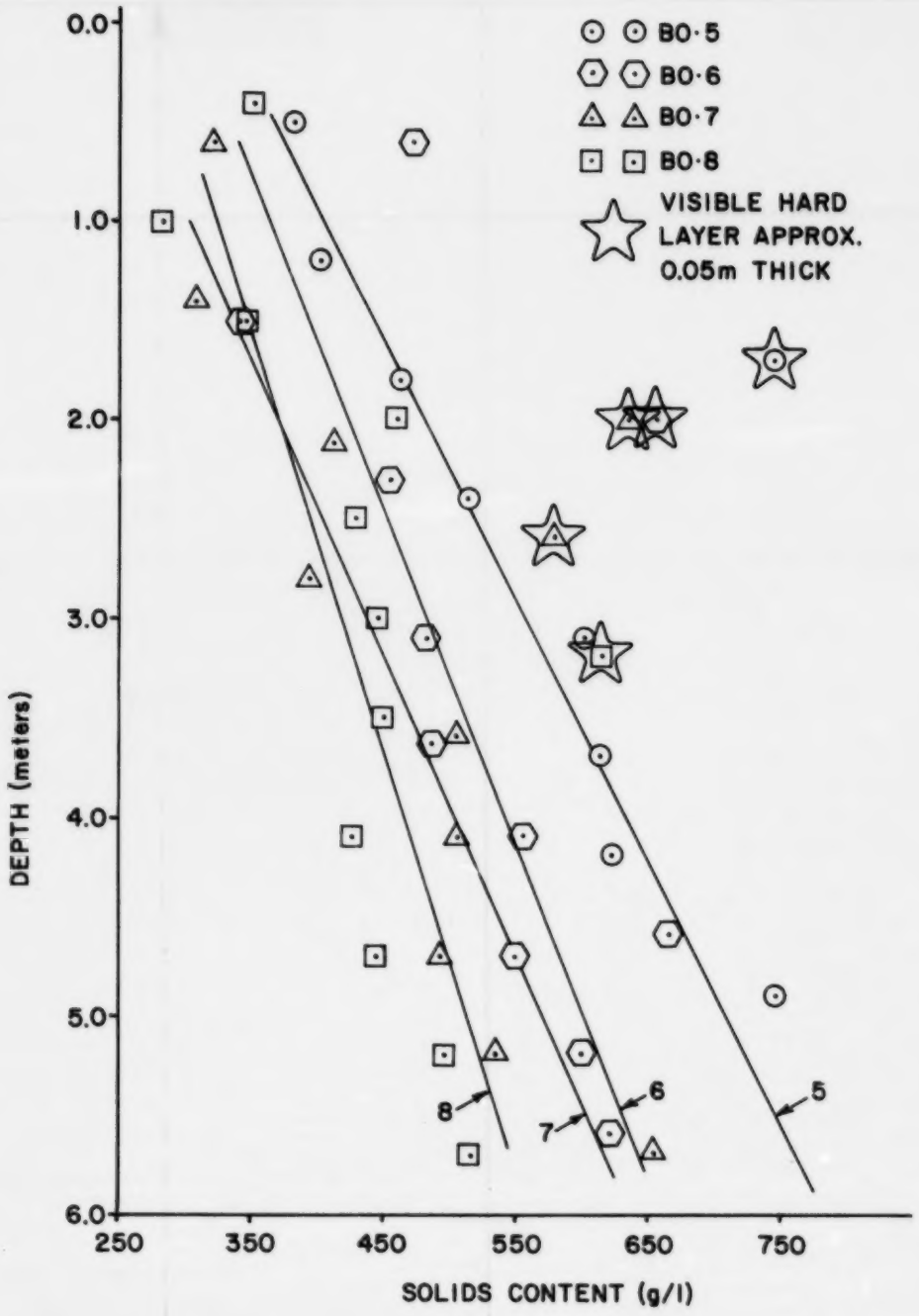

Figure 11. Solids content vs depth at Bonsal site--small pond.

SECTION 5

RECLAMATION OF PONDS

The ultimate reclamation of a storage pond raises questions which are difficult. The nature of deep-stored slimes is to remain fluid indefinitely. The author visited an old mined-over area near one of the study sites. Slimes of age greater than 25 years were overlain with coarse sand. There was good surface drainage. Very soft clays were found at a depth of less than three feet, soft enough to be squeezed through the fingers when making a fist. Even though there was scrubby overgrowth in the area, one could not drive a truck through without sinking in.

The reclamation of a slime pond to dry land must, therefore, include effective surface-hardening treatment. It may be feasible and economical in some cases to use a soil-cement treatment or similar stabilization process involving additives. The use of plants which promote high rates of transpiration may be productive, although there are indications (see Section 3) that capillary activity extends only to a depth of one meter or slightly more. To be significantly effective, such plants should be deeply rooted.

Once it is decided to store slimes at great depth, very little can be done to reduce the water content in the deeper layers.

It is apparent that these slime ponds can be reclaimed as artificial lakes. The supernatant above ponds storing settled kaolinitic slimes is quite clear. The settled slimes are not much disturbed by wind waves. The bottom would remain exceptionally soft, but that should not be objectionable in a lake deeper than wading depth. It seems most reasonable to this author to include in the reclamation plan artificial lakes above abandoned slime-storage ponds.

SECTION 6

ALTERNATIVE DEWATERING SCHEMES

This section is devoted to brief discussions of schemes considered as alternatives to deep storage of slimes and discarded for one reason or another.

THICKENING/FILTRATION

It is feasible to thicken slimes, as is being done at the Bonsal site, from the primary effluent of 30 to 60 g/l (3 to 6% by wt) solids content to approximately 200 g/l (18% by wt) or higher, and to put the thickened slimes through rotary or bed filters. The high resistance to filtration, coupled with the large slimes production rate at these sites, indicates a very large filter installation. Not only are filters quite capital-intensive, they are also costly to operate and maintain. The author judges that a filter installation would cost much more than the present storage system, unless a filter aid can be found which would profoundly affect the resistance to filtration of the slimes. Chemical addition, for this and other purposes, is discussed below.

VIBRATION/FLOC DISTURBANCE

Tests were conducted to determine the effects of intermittent decanting with stirring and continuous vibration on the dewatering characteristics of clay slimes. The tests were carried out in 2000-ml graduates.

Intermittent Decanting

A composite sample of Bonsal high-pond influent (202 g/l initially) was settled and drained of clear supernatant twice daily for one week and once daily for one additional week. A low speed stirrer was inserted into the sample between drainings. Solids concentration curves for this sample, as well as an undisturbed sample, are plotted on Figure 12.

Vibration Testing

Settling rates were measured for a sample of Bonsal high-pond influent (270 g/l initially) which was subjected to continuous vibration at a frequency of 100 cycles per minute. Data were also recorded for a control sample and an undisturbed sample with bottom drainage. Results are plotted on Figure 12.

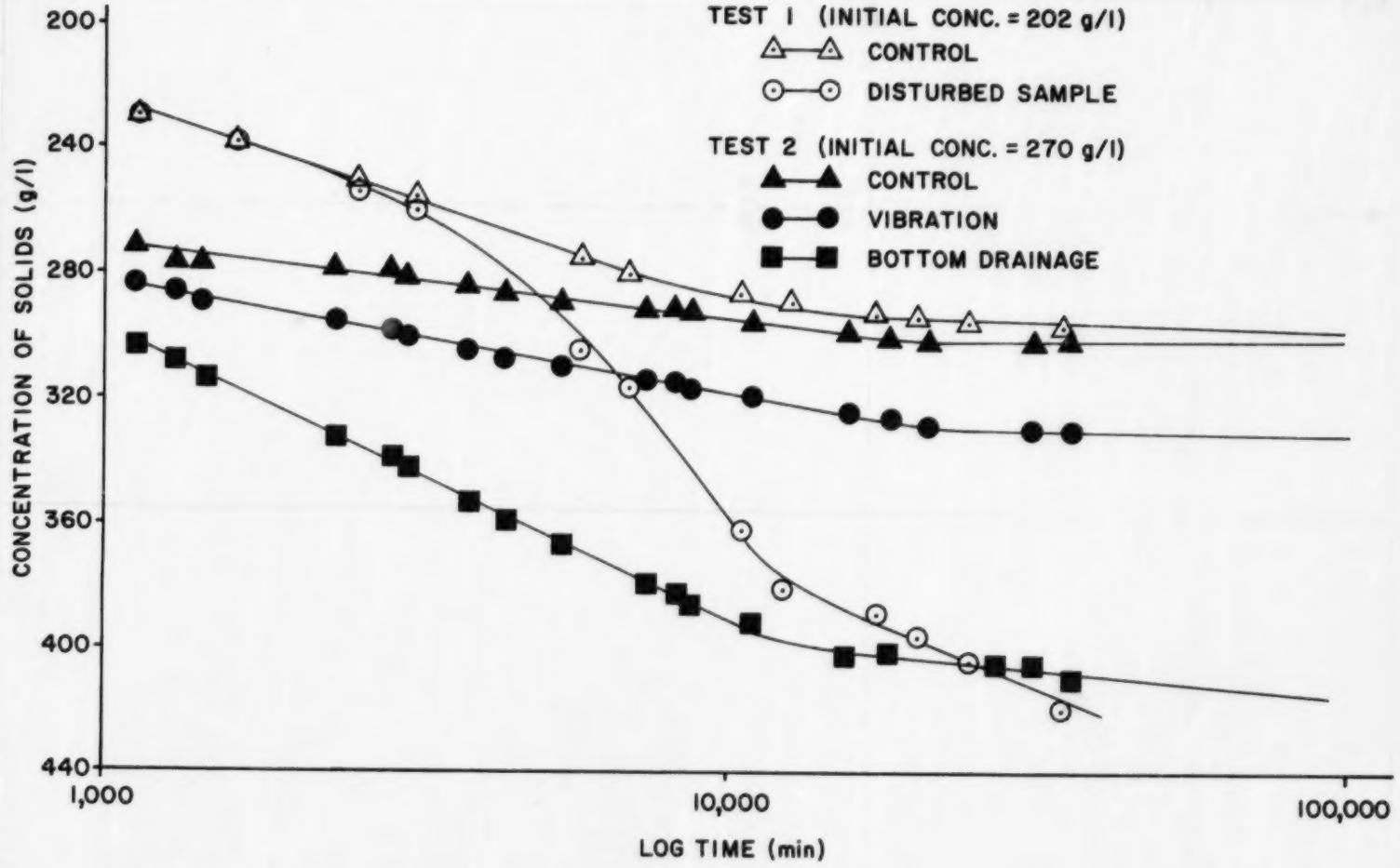

Figure 12. Results of floc disturbance tests, Bonsal high-pond influent.

Results

An examination of Figure 12 indicates that disturbances enhance the rate and final degree of dewatering of clay slimes. Intermittent draining with stirring increased the final slimes concentration by 35 percent, while vibration increased the final slimes concentration by 9 percent. It is also evident that, at shallow depths, bottom drainage is as effective in increasing the degree of dewatering as is intermittent draining with stirring.

The degree of enhancement is a function of the amount of shearing of floc aggregates and, therefore, a function of the type of disturbance. The more intense shear forces induced by stirring, as compared with vibration, are believed to be responsible for the higher final solids concentration experienced in the first series of tests. The final solids concentration measured for both control samples compares favorably with the asymptotic limit of 305 g/l, as measured separately with a 2.4 m (8-ft) settling column.

The results of these disturbance tests indicate that while disturbances might be used to enhance dewatering of clay slimes, they are probably infeasible and insufficient as a stand-alone dewatering method. At full scale, the energy input requirement would be high, and the mechanism to distribute the disturbance through a large slime mass was not found.

The vibration-floc-disturbance approach does not improve ultimate dewatering beyond the apparent limit attainable by simple storage. It just shortens the time required to attain that limit, which is in the range 300 to 400 g/l (25 to 30% by wt) depending on storage depth. As observed previously, at this final solids content the slimes remain fluid and difficult to reclaim.

The chief advantage of floc disturbance occurs in the thickening phase where the material could be brought to a higher solids content in less time by employing the scheme. In a conventional thickener, this is done by means of the revolving "picket fence." At the Bonsal site, enhancement of thickening has not been necessary. A primary settling pond is sufficient.

CHEMICAL ADDITIVES

In the preliminary work prior to this project, the addition of certain polymers was observed to have a profound effect on settling characteristics and resistance to filtration of clay slimes. The dose rates in either settling or filtration improvement, however, were high enough that chemical costs alone would render a chemical treatment uneconomical. Given the small number of dewatering alternatives available at the beginning of the project, and given the potential for finding an economical additive in a more thorough study, considerable project effort was directed at a study of polymer/kaolinite interaction.

Although the study contributed much to the understanding of polymeric treatments of clays, it did not provide an economical alternative for dewatering clays. Whether the addition of chemicals were to be made in the thickening or storage phases of the existing operation, or as a filter aid in a

thickening/filtration scheme, no way was found to improve economically the current system.

To summarize the polymer study, the effect of cationic polymer molecular structure upon the flocculation of a negatively charged kaolinite clay suspension was determined by examining the settling rate of the clay and the electrophoretic mobility of the clay particles after the addition of various amounts of polymer. A series of commercial cationic polymer flocculants were examined with regard to polymer molecular weight, polymer chain stiffness, and polymer charge density.

Polymer bridging between clay particles was found to be the major cause of an increase in the settling rate of the clay suspension with charge neutralization of the clay particles being of minor importance. This polymer bridging was the result of polymer molecules adsorbing onto specific adsorption sites present on the surface of the clay particles. The term "effective bridging length" was introduced to provide a means of predicting the ability of a polymer molecule to undergo polymer bridging between clay particles on the basis of the polymer molecular structure. The effective bridging length decreases as the molecular length and stiffness of a polymer molecule increase and decreases as the polymer molecule-clay surface attraction increases. As the effective bridging length of a polymer molecule is increased, the probability of undergoing polymer bridging is increased.

USE OF WICKS

Briefly examined was the idea of using fabric strips placed vertically in the slime mass so as to extend into the air such that evaporation might be enhanced and migration of water from the deeper zones might be accelerated. The phenomenon could be demonstrated in beakers at the lab bench to have some small potential in the field, but no realistic way was found to incorporate the scheme at full scale.

It is feasible to use sand drains in various ways to provide internal drainage ways to allow water to migrate from the slime mass more rapidly and more completely. Underdrains may be incorporated in the storage area. Vertical sand shafts may be included. The key to success in sand drains is to minimize the distance water must travel to the nearest drainage point. Ten feet in these slimes appears to be too far to drain effectively. The required density of drainage channels, the expense and difficulty of putting them in place, and the fact that sand is the plant product are reasons given by the operating people for not using sand drains in slime storage ponds.

SECTION 7

PROCESS MODIFICATION

Given that the disposal of wet clay slimes is difficult and expensive, the basic process of sand-and-gravel production was examined to see if there are reasonable alternatives for modifying the process to avoid the production of large volumes of clay slimes.

DRY PROCESSING

Instead of processing the ore by washing, the possibility of dry screening of the products exists but only for the coarser fractions of the product. Even if dry processing of the entire product range were physically feasible, there would be concern for the dust problem generated by the large quantity of fine material produced. Dry processing is also rendered infeasible by the fact that the material is generally wet when mined. Frequently, the pit bottom is below the water table or rain water collects in the excavation area.

PRETREATMENT

The idea of pretreating the ore to remove the slimes at the pit was considered and discarded. Such a pretreatment scheme would require equipment capable of recovering the finest fraction of marketable sand. To locate this equipment at the pit would essentially require movement of the existing processing plant to the pit. Most mines operate at two or more pit sites concurrently. To relocate requires duplication or loss of flexibility. In relatively shallow deposits, as most are, pit plants would be subject to frequent and expensive relocation. Finally, in the Lilesville area, the sand-and-gravel deposits are in the hilltops, removed some distance from a source of wash water. The lack of process-water supply would preclude pretreatment to remove slimes at the pit.

SECTION 8

THE DRYING-CELL SCHEME

In this project, the most promising alternative for disposing of clay slimes from sand-and-gravel operations is the drying-cell scheme. The approach is to apply thickened slimes to drying beds in a sequential batch process. At a given time, one cell is filling, one is being emptied and several are in the process of drying.

BACKGROUND

The W.R. Bonsal Company, Lilesville, N.C., began to use a two-cell system in the fall of 1974 when their original slime pond became filled and a second pond was brought into the system. Early in the life of the second pond, there was no intention of reloading any full pond. As the original pond drained and dried, however, considerable subsidence of the surface was observed where the supernatant and collected rain water was drained from the surface. As the second pond began to fill, it was decided to raise the dam and reuse the first pond for another cycle of loading.

It was found that surface drainage of supernatant and rain water could be insured by placing slimes in the storage pond thickened to a consistency which will cause the deposited slimes to form a drainage gradient (a slope surface) from the discharge point to the storage-pond outlet. This was accomplished through a change in operating procedure of the dredge in the thickening pond from which slimes were pumped to the storage pond. By placing the dredge inlet in the bed material such that the pump suction exceeded 50 cm of mercury (about 20 inches), and such that line pressure at the dredge-pump outlet was a maximum, the discharged material could be placed in the storage pond at a solids content of 250 to 300 g/l (22 to 25% by wt). At this higher concentration when initially placed, the slimes in the storage pond would form a slope measured at 0.0027 over a distance of about 460 m (1500 ft).

Over five loading cycles, it was observed that in three months drying time the material would dry from a solids content of 250 g/l (22% by wt) to 1200 g/l (69% by wt) for deposits attaining a final depth of 30 cm (1 ft).

The keys to success of this operation are to drain surface water from the stored slimes continuously, for even a thin layer of water covering the slimes inhibits air and sun drying, and to place the slimes in the storage pond at a solids content of 250 g/l (22% by wt) or higher to effect a drainage slope across the pond.

THE DRYING CELL CONCEPT

The intermittent loading of multiple drying cells (shallow ponds) is an alternative to storage ponds. Storage ponds require the construction of dams and excavation and preparation of the reservoir area. When filled, the process must be repeated, perhaps at a more unfavorable location relative to the plant. The establishment of single-layer drying cells, which are emptied after the slimes are dried, would require dikes of no more than 3 m (10 ft) in height. The dried material would be favorably situated for efficient removal by a variety of earth-moving equipment, and final disposition and incorporation in the pit is logical. Several variations on the drying-cell theme exist.

Operating Assumptions

The following operating assumptions are based on the W. R. Bonsal Co. installation. The mass balance is made for the high-production year of 1974. Waste flows and concentrations agree with project measurements. Reference is made to the accompanying mass balance which shows these relationships graphically (Figure 13).

The design plant production is 1.45×10^9 kg/yr (1.6 million tons/yr). The plant waste entering the thickening pond is 2.7×10^8 kg/yr (300,000 tons/yr), at a solids content of 28 g/l (2.8% by wt) and at an average flow rate of 0.076 m^3/s (1200 gpm). After deducting the estimated annual quantity of material diverted to the sanitary landfill, the annual delivery to the drying beds is 1.8×10^8 kg (200,000 tons) at a design solids content of 250 g/l (22% by wt) and at a flow rate of 0.010 m^3/s (2000 gpm).

The assumptions regarding drying-cell behavior are that in 3 months drying time material deposited at 250 g/l (22% by wt) will dry to 1200 g/l (69% by wt) if the final dry depth is 30 cm (1 ft).

Cell Requirements

The number of cells required is determined by the number of distinct cell operations in terms of the loading time unit. For example, if the loading time per cell is one week, the number of cells required is one for loading, 13 for drying (13 weeks = 3 months), and one for emptying, a total of 15.

DESIGN CASE STUDY

This is a preliminary design study intended to examine the feasibility of the idea. Three operational scales are studied: one similar to the largest of the mining units participating in project, the second an intermediate level, and the third approximately the size of the smallest of the mines. The loading rates are 1.8×10^8 kg/yr (200,000 tons/yr), 1.1×10^8 kg/yr (120,000 tons/yr) and 5.4×10^7 kg/yr (60,000 tons/yr).

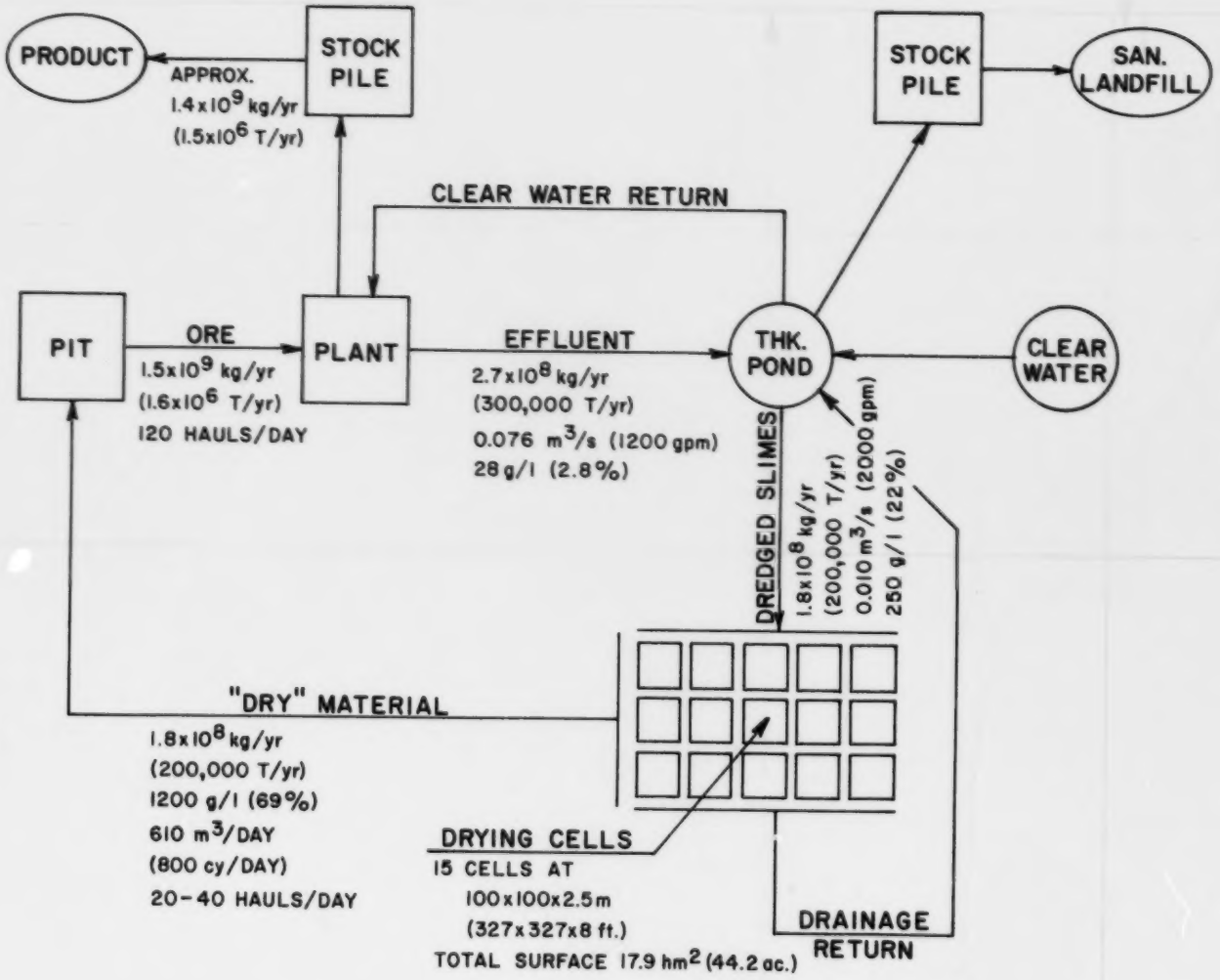

Figure 13. Schematic of Bonsal operation with drying cells showing mass balance for high operating capacity.

Critical Parameters

The parameters which appear to determine the minimum investment in drying cells are:

1. Depth to which capillary activity takes place. This depth is the maximum initial placement depth at which complete drying to the final solids content will occur. Material placed deeper will not be expected to dry in a reasonable length of time. Subject to further study, a depth of 1 m (3.3 ft) appears to be a reasonable design depth.

2. Cell drying time. This is the time required for the material to dry from the initial to final solids content when placed at the initial depth. Rather obviously, it depends on a large number of environmental factors and on other design choices. Based on observed field performance, 13 weeks appears to be best for design.

3. Initial Solids Content. The wetness of the material when placed determines the quantity of water which must be removed to bring the material to the target solids content. An initial solids content of 150 g/l seems to be routinely workable.

4. Final Solids Content. The final solids content should be significantly greater than the Atterburg Liquid Limit (estimated at 800 g/l) if the material is to be removed from the cells. Final solids content of 1000 g/l (62 lb/cu ft) ought to be routinely achievable.

Some Configurative Relationships

Let F = Number of load cycles per year

P = Number of operating weeks per year

T = Loading period for one cell (wk)

D_i = Initial depth (m)

D_f = Final depth (m)

C_i = Initial solids content (g/l)

C_f = Final solids content (g/l)

A_c = Cell area (ha)

A_t = Total area (ha)

N = Number of cells

L = Loading (kg/yr)

(1) $F = \frac{P}{T}$

$$(2)\ D_f = \frac{D_i C_i}{C_f}$$

$$(3)\ A_c = \frac{L \times 10^{-4}}{F C_f D_f}$$

$$(4)\ A_t = N\ A_c$$

Sensitivity of Total Cell Area to Changes in Design Variables

The following values are set except where the parameter is being varied in the sensitivity analysis:

1. Cell loading time = 1 week
2. Operation = 50 wks/yr
3. No. cells = 15
4. Initial solids content = 150 g/l
5. Final solids content = 1000 g/l
6. Initial depth = 1 m (3.3 ft)

The results of the sensitivity analysis are shown in Figures 14 through 17.

The total cell area required theoretically decreases as the number of cells increases. However, an economically optimum cell size is evident because as the number of cells increases the cost of ancillary devices (dikes, inlets, outlets) also increases.

Preliminary Design Results

The following summarizes the design of drying-cell systems for each of the three loading rates under consideration. Source parameters for the design are:

1. Initial solids content = 150 g/l
2. Final or target solids content = 1000 g/l
3. Initial placement depth = 1 m
4. Drying time = 13 weeks
5. Cell loading time = 1 week
6. No. of cells = 15
7. No. loadings per year = 50

Based on these source data, the following were determined:

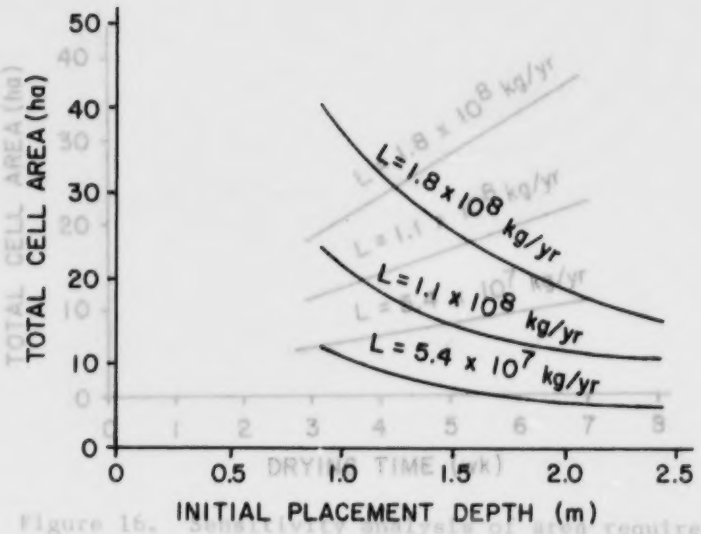

Figure 14. Sensitivity analysis of area requirements with initial depth.

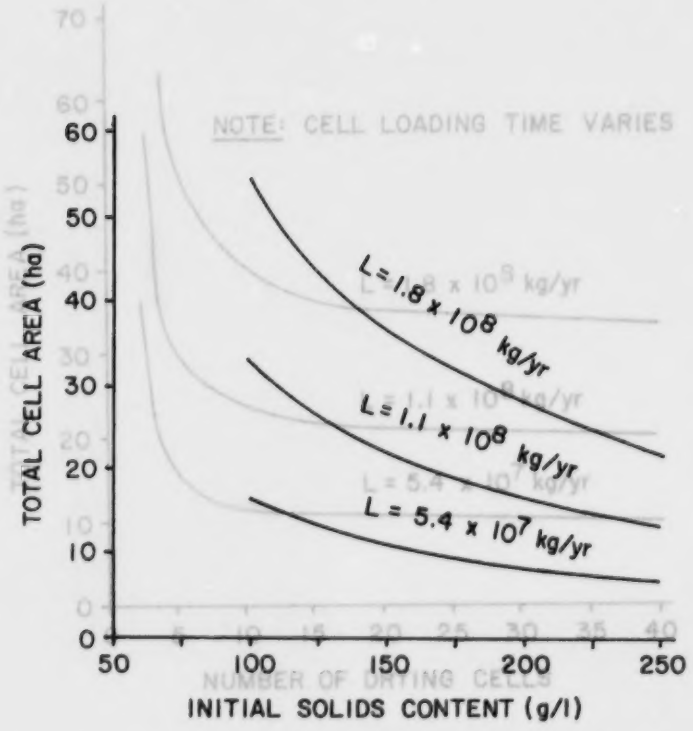

Figure 15. Sensitivity analysis of area requirements with initial solids content.

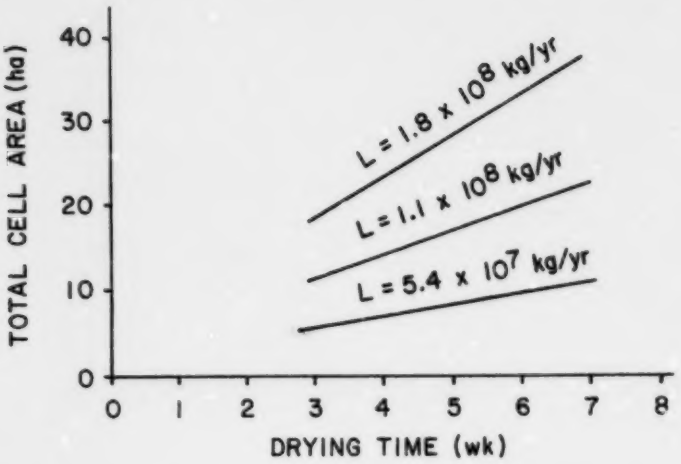

Figure 16. Sensitivity analysis of area requirements with drying time.

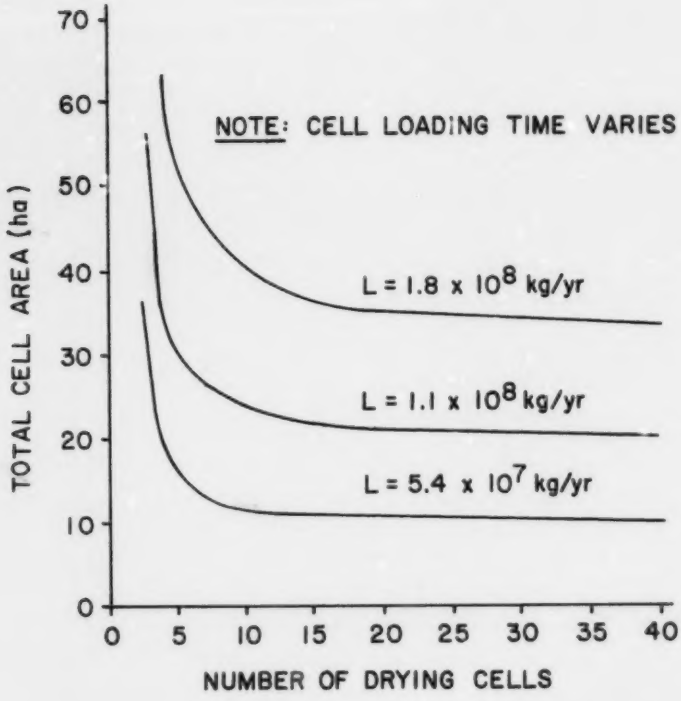

Figure 17. Sensitivity analysis of area requirements with number of cells.

Loading rate (kg/yr)		1.8×10^8	1.1×10^8	5.4×10^7
(A)	Cell area (ha)	2.5	1.4	0.7
(B)	Total cell area (ha)	36	22	11
(C)	Final depth of material (m)	0.15	0.15	0.15
(D)	Yield, or haul (m^3/wk)	3600	2200	1100
(E)	Length of side of square cell (m)	160	120	85
(F)	Length of cell 100-ft wide (m)	790	470	240
(G)	Inflow pump time @ 126 l/s (hr/wk)	53	32	16
(H)	Pump rate for 40-hr pump wk (l/s)	170	100	50

DRYING CELLS APPLIED TO THE BONSAL OPERATION

It was observed at the Bonsal site that solids content of the thickened slimes could readily be maintained at 250 g/l (22% by wt) with proper dredge operation. The arrangement shown in Figure 13 was obtained on that basis, with a mass loading of 1.8×10^8 kg/yr (200,000 tons/yr), final dried depth of 30 cm (1 ft).

Noting that the reduction in total cell surface area is not large for cell loading times below one week, one week is selected for its convenient conformance with a weekly operation schedule for the entire plant. Accordingly, 15 cells at 0.99 ha (2.45 acres) each would be used.

Cell Shape

Two cell shapes were under consideration: square and elongated. A square cell has the advantages of using less dike length and providing drainage from a central outlet toward the periphery in all directions. The author judges that this will provide the best drainage pattern. Here, the cell would be 100 m (327 ft) on a side.

The elongated cell would be sized such that a dragline having a 15-m (50-ft) horizontal reach would be capable of reaching any point in the cell to correct a faulty drainage pattern. Holding the cell to 30 m (100 ft) width would require a cell length of 330 m (1085 ft) to produce the desired surface area. Land availability and cell behavior over time would dictate which is best.

The maximum cell depth required is dependent upon the degree of dryness and the initial and final solids contents. Where the initial solids content is 250 g/l (22% by wt) and the final solids content is 1200 g /l (69% by wt), the surface will subside by a factor of 1200/250, or 4.8, assuming no drainage

to take place until cell loading is complete, which is conservative. Accordingly, a cell depth of 2.5 m (8.2 ft) would leave a generous freeboard when the final design depth is 30 cm (1 ft), the expected average subsidence being 1.5 m (4.8 ft). The 2.5 m (8.2 ft) depth would provide sufficient volume to doubledeck a cell if adverse drying conditions so dictated.

Cell Excavation

A dried cell could be excavated using any of several combinations of earth-moving equipment. It would be expected that front-end loaders, scrapers, haulers, and draglines could operate within the cell at the end of the drying period.

Some acceptable combinations of equipment are: front-end loader and haulers, dragline and haulers, grader followed by front-end loader and haulers, or scraper alone. Combinations can be selected so as to fit in with other plant operations, affording multiple uses for equipment.

Production required for this case is 3.6×10^6 kg/wk (4000 tons/wk), which at 1200 g/l (69% by wt) solids content, comes to approximately 610 m^3/day (800 cu yd/day) on a five-day week.

At the end of the drying cycle, the slimes are dryer than the Atterburg Liquid Limit (moisture content, soil mechanics definition, of 80%; solids content 844 g/l or 56% by wt). Field observations of the material indicate that earth-moving equipment can operate in the cell.

Weather Influences

In any drying-cell operation, long spells of wet weather can severely inhibit performance. The system conceived here appears to possess inherent flexibility to accommodate bad weather. If all cells are full and no cell is sufficiently dry to excavate, the first option is to stop pumping to the drying cells, allowing slimes to accumulate in the thickening pond. When that option is no longer available, the driest cells may be "double-decked."

OTHER OBSERVATIONS

The drying-cell concept offers some distinct advantages over other alternatives, but there are potential operating difficulties that need further study. It was shown in Section 4 that intermittent loading of multiple storage ponds can improve storage efficiency by 40 percent. The potential improvement of drying cells over simple storage approaches a factor of five; that is, 80 percent of the water is removed by the energy provided by sun and wind. Deep storage of slimes, even if improved, still requires new facilities when existing ones are filled, which implies the need for large dams and ultimate reclamation. Drying cells, as contemplated here, constitute a steady-state system. Once the requisite area is committed to cells, it is used over and over. Small dikes are used in place of large dams.

But there are disadvantages which currently are seen by the operating people as being so severe that they would rather continue with deep storage.

Worst of these, in the opinion of the author, is the sensitivity to bad weather. During the project period, the winters brought several multi-week sieges of rain and muck. One of these ruined an attempted drying-cell test at the end of the field phase of the project. The drying-cell system would require careful management in bad weather.

Drying cells also call for additional handling of the waste not required by storage-pond schemes. Some field testing would determine whether the cost of excavation of the cells and the loading of haulers to return the material to the pit would exceed the costs saved by eliminating the dams.

It is recommended that any mining group considering drying cells set up perhaps four full-size cells and operate them through a typical year before committing to the scheme as the sole disposal method.

REFERENCES

Akers, David J. and Edward A. Moss. "Dewatering of Mine Drainage Sludge, Phase II." EPA-R2-73-169, Environmental Protection Technology Series, U.S. Environmental Protection Agency, Washington, D.C., 1973.

American Public Health Association, American Water Works Association, Water Pollution Control Federation, Standard Methods for the Examination of Water and Wastewater, 13th Ed., American Public Health Association, Washington, D.C., 1971.

Black, C.A., D.D. Evans, J.L. White, L.E. Ensminger, F.E. Clark, Methods of Soil Analysis, No. 9 in Series: Agronomy, American Society of Agronomy, Madison, Wisconsin, 1965.

Coackley, P., "Lab Scale Filtration Experiments and Their Application to Sewage Sludge Dewatering", in Proceedings, Conference on Anaerobic Digestion and Solids Handling, Manhattan College, N.Y., Reinhold, 1958.

Redeker, Immo H., Chief Engineer, Minerals Research Laboratory of North Carolina State University, Asheville, N.C., personal communication, 1982.

Staff, Bureau of Mines. "The Florida Phosphate Slimes Problem, A Review and Bibliography," Tuscaloosa Metallurgy Research Laboratory, Bureau of Mines Circular IC 8668, 1975.

APPENDIX A

BASIC DATA SET OF PLANT EFFLUENT MEASUREMENTS

EXPLANATION OF DATA

The data listed in the following tables are in metric (SI) units where applicable. The data collected and test results obtained from plant slime samples are:

DATE:	Date of sample collection (month, day, year)
TIME:	Time of sample collection (military clock)
CONC:	Solids concentration of sample (grams per liter)
P10,P40,P200:	Sieve analysis for #10, #40, #200 sieves, respectively
S1,B1,S2,I2,B2:	Five parameters of settling curve in 100 ml graduate at original concentration (see Settling Test Procedures)
RES:	Specific Resistance to Filtration ($s^2/g \times 10^{-8}$)(See Filtration Test Procedure)
pH:	Standard pH probe measurement of supernatant
ORE:	Ore processing rate (tonne per day) (for English tons multiply by 1.1)
WASH:	Wash water rate ($m^3/day \times 10^{-3}$) (For million gallons per day, multiply by 0.264)
HT:	Daily Maximum Temperature (°C) in previous 24 hours
LT:	Daily Minimum Temperature (°C) in previous 24 hours
WB:	Wet-bulb Temperature (°C) at sample collection time
DB:	Dry-bulb Temperature (°C) at sample collection time
ST:	Sample Temperature (°C) at sample collection time
RAIN:	Monthly Accumulated Rainfall (cm) (For inches multiply by 0.394)
HOURS:	Plant operating time (hr) for that day

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
21JAN76	1400	27.7	.	.	.	1.92	4.5	.	.	.
16FEB76	.	30.9	100	100	78.0	2.13	6.0	.	.	.
17FEB76	1015	25.7	100	100	81.3	1.60	5.3	5675	28.8	9.3
17FEB76	1505	27.9	100	100	80.0	1.65	4.4	.	.	.
18FEB76	958	10.3	100	100	83.5	3.61	4.5	5307	23.9	.
18FEB76	1507	23.4	100	100	84.2	2.24	4.4	.	.	.
19FEB76	1015	26.4	100	100	80.2	1.66	4.4	.	.	.
19FEB76	1015	18.2	100	100	75.9	1.69	4.4	3083	14.8	5.0
23FEB76	1030	29.7	100	100	77.8	1.60	4.5	.	.	.
23FEB76	1515	20.0	100	100	81.0	2.31	5.0	.	.	.
01MAR76	1030	47.1	100	100	75.2	2.48	4.8	.	.	.
01MAR76	1430	39.9	100	100	74.4	1.78	5.0	.	.	.
02MAR76	1018	39.8	100	100	72.6	1.76	5.3	6063	28.8	10.0
02MAR76	1520	44.3	100	100	69.1	1.61	4.9	.	.	.
03MAR76	958	44.3	100	100	60.7	1.95	4.4	7348	29.6	9.5
03MAR76	1500	21.1	.	.	.	2.99	4.5	.	.	.
08MAR76	1000	55.2	100	100	53.1	1.97	4.5	2833	14.8	5.0
08MAR76	1512	38.5	100	100	60.7	0.75	4.5	.	.	.
09MAR76	1010	30.7	100	100	70.9	2.38	4.5	6858	28.8	9.9
09MAR76	1505	35.8	100	100	69.8	2.02	4.5	.	.	.
10MAR76	1050	33.1	100	100	61.9	0.71	4.6	5756	29.6	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
21JAN76	-22.9	24	-.152	244	190	.	.	.	.	6	.
16FEB76	-23.9	24	-.145	271	120	.	.	.	.	13	.
17FEB76	-32.0	15	-.264	286	100	26	11	15	21	13	3.2
17FEB76	-27.3	12	-.333	263	100	.	.	.	.	15	.
18FEB76	.	.	.	.	.	26	12	16	20	14	3.2
18FEB76	-33.6	20	-.264	205	80	.	.	.	.	15	.
19FEB76	-37.5	15	-.281	254	100	.	.	.	.	14	.
19FEB76	-59.2	10	-.184	158	100	26	13	11	16	14	3.2
23FEB76	-31.8	18	-.343	301	100	19	0	1	7	12	3.7
23FEB76	-54.8	10	-.172	188	86	.	.	.	.	12	.
01MAR76	-15.4	35	-.279	355	140	.	11	17	22	.	0.0
01MAR76	-18.3	30	-.162	280	120	.	.	.	.	17	.
02MAR76	-19.4	30	-.274	314	120	28	7	17	20	16	0.0
02MAR76	-21.0	17	-.261	334	120	.	.	.	.	17	.
03MAR76	-16.1	17	-.319	342	120	29	11	15	21	17	0.0
03MAR76	-63.0	15	-.010	72	110	.	.	.	.	18	.
08MAR76	-13.8	36	-.328	369	110	18	1	7	12	15	2.0
08MAR76	-23.1	22	-.229	279	110	.	.	.	.	16	.
09MAR76	-25.7	24	-.172	211	100	11	6	7	8	14	2.9
09MAR76	-23.8	25	-.174	221	140	.	.	.	.	14	.
10MAR76	-32.9	15	-.992	255	140	16	0	3	7	13	3.1

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
10MAR76	1505	32.4	100	100	69.8	2.61	4.6	.	.	.
15MAR76	1005	37.5	100	100	68.8	1.84	4.6	6920	29.6	10.0
15MAR76	1455	35.9	100	100	69.1	2.39	4.7	.	.	.
16MAR76	1007	23.2	100	100	76.7	2.60	4.7	5777	29.6	9.8
16MAR76	1500	19.4	100	100	83.0	2.64	4.6	.	.	.
17MAR76	945	22.7	100	100	76.7	1.84	4.6	3674	29.6	10.0
17MAR76	1515	7.1	100	100	62.0	1.47	4.9	.	.	.
22MAR76	1005	23.9	100	99	67.4	3.19	5.0	4961	29.6	8.3
22MAR76	1505	7.1	100	100	50.7	1.14	5.1	.	.	.
23MAR76	1020	18.0	100	100	78.3	1.86	4.8	5511	29.6	10.0
23MAR76	1500	21.6	100	100	77.3	2.03	5.7	.	.	.
24MAR76	1010	26.8	100	100	71.6	2.92	4.9	5655	29.6	10.0
24MAR76	1600	21.8	100	100	60.6	2.38	5.1	.	.	.
29MAR76	948	13.4	100	100	73.1	2.92	4.8	4512	29.6	10.0
29MAR76	1445	13.3	100	100	70.7	2.18	4.9	.	.	.
30MAR76	1000	.	100	100	.	0.64	5.8	3756	29.6	9.0
30MAR76	1530	32.6	100	100	92.2	1.90	4.6	3756	29.6	9.0
31MAR76	1005	24.5	100	100	77.9	2.59	4.5	4144	29.6	9.0
31MAR76	1505	40.0	100	100	69.2	1.93	4.7	4144	29.6	9.0
05APR76	1015	8.0	100	100	82.1	1.96	4.9	4430	29.6	9.8
05APR76	1500	21.8	100	100	64.3	1.44	4.6	4430	29.6	9.8

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
10MAR76	-23.6	22	-.223	261	120	.	.	.	.	15	.
15MAR76	-23.5	19	-.318	367	80	14	2	8	10	13	4.4
15MAR76	-19.6	20	-.318	297	90	.	.	.	.	14	.
16MAR76	-32.4	20	-.239	221	60	18	8	11	13	12	6.5
16MAR76	-38.8	15	-.213	203	70	.	.	.	.	13	.
17MAR76	-52.0	11	-.193	191	70	20	-1	1	7	8	8.5
17MAR76	.	.	.	.	.	.	.	.	.	9	.
22MAR76	-26.2	15	-.350	330	80	17	-2	2	7	14	8.5
22MAR76	.	.	.	.	.	.	.	.	.	15	.
23MAR76	-56.0	11	-.185	186	70	21	-1	6	12	13	8.5
23MAR76	-46.0	12	-.226	229	70	.	.	.	.	15	.
24MAR76	-19.0	30	-.285	261	77	22	1	9	16	14	8.5
24MAR76	-48.0	13	-.226	249	70	.	.	.	.	14	.
29MAR76	-77.5	10	-.078	97	60	17	9	12	18	9	8.7
29MAR76	-89.5	10	-.022	59	50	.	.	.	.	9	.
30MAR76	.	.	.	.	.	23	14	14	18	9	10.3
30MAR76	.	.	.	.	.	23	14	14	18	18	10.3
31MAR76	.	.	.	.	.	24	14	16	18	17	10.5
31MAR76	.	.	.	.	.	24	14	16	18	18	10.5
05APR76	.	.	.	.	.	21	3	4	12	16	0.5
05APR76	.	.	.	.	.	21	3	4	12	18	0.5

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
06APR76	1010	20.8	100	100	71.4	1.68	4.5	3225	29.6	6.0
06APR76	1505	54.3	100	100	67.5	1.50	4.2	3225	29.6	6.0
07APR76	1000	38.9	100	100	73.3	1.38	4.2	6078	29.2	10.0
07APR76	1500	26.8	100	100	70.9	1.61	4.4	6078	29.2	10.0
12APR76	1005	7.2	100	100	58.7	0.80	5.0	6144	29.6	10.0
12APR76	1510	41.4	100	100	71.7	1.70	4.3	6144	29.6	10.0
13APR76	945	35.8	100	100	73.9	1.97	4.4	4838	29.6	10.0
13APR76	1510	26.4	100	100	68.6	1.57	4.3	4838	29.6	10.0
15APR76	1000	31.4	100	100	77.7	2.37	4.3	3615	29.6	9.8
15APR76	1500	12.5	100	100	74.1	2.89	4.7	3615	29.6	9.8
26APR76	1005	34.9	100	100	77.9	1.70	4.5	7043	29.6	9.8
26APR76	1513	25.6	100	100	76.4	1.64	4.3	7043	29.6	9.8
27APR76	1000	32.8	100	100	.	1.42	4.2	5266	29.6	10.0
27APR76	1500	44.1	100	100	71.3	1.24	4.0	5266	29.6	10.0
28APR76	1010	31.6	100	100	71.8	1.45	4.1	6349	29.6	10.0
28APR76	1545	30.8	100	100	72.1	1.50	4.1	6349	29.6	10.0
03MAY76	955	55.8	100	100	69.3	1.33	4.2	5042	29.6	8.6
03MAY76	1445	55.4	100	100	68.1	1.56	4.1	5042	29.6	8.6
04MAY76	1005	.	.	.	.	.	4.6	5879	29.6	9.1
04MAY76	1455	31.9	100	100	77.5	1.89	4.4	5879	29.6	9.1
05MAY76	955	32.4	100	100	72.0	1.65	4.3	6553	29.6	9.3

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
06APR76	.	.	.	.	.	26	4	10	18	16	0.5
06APR76	.	.	.	.	.	26	4	10	18	18	0.5
07APR76	.	.	.	.	.	26	6	8	20	14	0.5
07APR76	.	.	.	.	.	26	6	8	20	18	0.5
12APR76	.	.	.	.	.	19	-1	2	10	15	0.5
12APR76	.	.	.	.	.	19	-1	2	10	17	0.5
13APR76	.	.	.	.	.	24	-1	8	16	15	0.5
13APR76	.	.	.	.	.	24	-1	8	16	17	0.5
15APR76	.	.	.	.	.	31	11	14	22	19	0.5
15APR76	.	.	.	.	.	31	11	14	22	20	0.5
26APR76	.	.	.	.	.	22	12	10	18	21	0.5
26APR76	.	.	.	.	.	22	12	10	18	24	0.5
27APR76	.	.	.	.	.	21	3	4	12	18	0.5
27APR76	.	.	.	.	.	21	3	4	12	21	0.5
28APR76	.	.	.	.	.	21	13	4	11	18	0.5
28APR76	.	.	.	.	.	21	13	4	11	20	0.5
03MAY76	.	.	.	.	.	27	7	12	20	19	3.0
03MAY76	.	.	.	.	.	27	7	12	20	21	3.0
04MAY76	.	.	.	.	.	21	6	7	13	19	3.0
04MAY76	.	.	.	.	.	21	6	7	13	20	3.0
05MAY76	.	.	.	.	.	26	6	12	18	19	3.0

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
05MAY76	1515	43.0	100	100	69.1	1.53	4.3	6553	29.6	9.3
10MAY76	1005	43.1	100	100	76.1	1.56	4.2	6031	28.0	9.0
10MAY76	1455	28.1	100	100	79.1	1.64	4.3	6031	28.0	9.0
11MAY76	955	38.6	100	100	74.2	2.76	5.7	6226	27.7	8.8
11MAY76	1540	15.6	100	100	75.0	3.28	4.2	6226	27.7	8.8
12MAY76	1000	42.8	100	100	74.0	1.52	4.1	5756	28.0	9.1
17MAY76	1030	41.5	100	100	72.3	1.91	4.3	6185	29.6	9.0
17MAY76	1510	32.5	100	100	78.3	1.80	4.3	6185	29.6	9.0
18MAY76	1000	36.6	100	100	81.4	2.08	4.3	7410	29.6	10.0
18MAY76	1450	17.6	100	100	87.0	1.72	4.5	7410	29.6	10.0
19MAY76	1005	48.0	100	100	75.8	1.87	4.4	6594	29.6	10.0
19MAY76	1540	50.7	100	100	73.7	1.79	4.4	6594	29.6	10.0
24MAY76	1530	33.0	100	100	78.1	1.39	4.6	.	.	.
25MAY76	1045	36.6	100	100	70.8	1.57	4.7	4888	29.6	9.7
25MAY76	1545	24.7	100	100	81.8	0.80	4.7	4888	29.6	9.7
26MAY76	1100	11.4	100	100	58.5	0.60	5.0	6185	25.8	8.5
26MAY76	1530	28.8	100	100	63.9	1.48	4.7	6185	25.8	8.5
31MAY76	1045	38.2	100	100	79.4	2.02	4.7	6450	29.6	10.0
01JUN76	1027	43.7	100	100	78.8	0.52	4.6	5695	29.6	10.0
01JUN76	1600	10.8	100	100	72.8	1.04	5.0	5695	29.6	10.0
02JUN76	1000	26.2	100	100	79.4	0.89	5.1	6430	29.6	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
05MAY76	.	.	.	.	.	26	6	12	18	20	3.0
10MAY76	.	.	.	.	.	24	6	12	19	20	3.7
10MAY76	.	.	.	.	.	24	6	12	19	20	3.7
11MAY76	.	.	.	.	.	29	14	17	19	20	3.7
11MAY76	.	.	.	.	.	29	14	17	19	21	3.7
12MAY76	.	.	.	.	.	29	13	17	22	21	5.6
17MAY76	.	.	.	.	.	27	16	18	23	23	12.1
17MAY76	.	.	.	.	.	27	16	18	23	24	12.1
18MAY76	.	.	.	.	.	23	17	18	23	23	12.6
18MAY76	.	.	.	.	.	23	17	18	23	23	12.6
19MAY76	.	.	.	.	.	22	13	7	17	20	12.6
19MAY76	.	.	.	.	.	22	13	7	17	21	12.6
24MAY76	.	.	.	.	.	.	.	.	.	22	.
25MAY76	.	.	.	.	.	22	16	11	14	21	14.8
25MAY76	.	.	.	.	.	22	16	11	14	22	14.8
26MAY76	.	.	.	.	.	27	12	16	21	22	14.8
26MAY76	.	.	.	.	.	27	12	16	21	22	14.8
31MAY76	.	.	.	.	.	30	16	22	28	23	14.8
01JUN76	.	.	.	.	.	33	19	21	23	24	0.0
01JUN76	.	.	.	.	.	33	19	21	23	26	0.0
02JUN76	.	.	.	.	.	32	18	20	24	24	0.0

DATE	TIME	CONC	P10	P40	P200	FES	PH	CRE	WASH	HRS
02JUN76	1530	33.8	100	100	81.2	0.92	4.7	6430	29.6	10.0
07JUN76	1510	11.0	100	100	91.3	2.84	5.0	6022	29.6	9.0
09JUN76	1045	46.5	100	100	77.2	1.41	4.6	6899	29.6	10.0
09JUN76	1540	10.8	100	100	82.3	5.85	5.0	6899	29.6	10.0
15JUN76	1000	18.3	100	99	76.8	0.89	5.5	6777	29.6	10.0
15JUN76	1545	49.0	100	100	71.4	1.17	5.1	6777	29.6	10.0
16JUN76	1015	12.0	100	100	82.1	2.73	6.1	6777	29.6	10.0
16JUN76	1450	12.2	100	100	.	2.04	5.5	6777	29.6	10.0
17JUN76	950	23.2	100	100	79.5	1.70	5.4	5980	29.6	10.0
22JUN76	912	31.4	100	100	70.0	1.78	5.2	4491	29.6	9.7
22JUN76	1545	33.3	100	100	76.6	1.80	5.1	4491	29.6	10.0
23JUN76	1455	25.4	100	100	83.5	2.06	4.9	6104	29.6	10.0
24JUN76	1000	33.0	100	100	78.0	1.32	5.0	5041	29.6	10.0
24JUN76	1510	29.8	100	100	69.4	1.25	5.2	5041	26.2	9.5
01JUL76	1000	33.1	100	100	79.6	1.79	4.9	5985	26.2	9.5
06JUL76	1000	37.6	100	100	80.8	2.04	5.2	4668	29.6	10.0
06JUL76	1540	25.8	100	100	74.7	1.31	5.4	4668	29.6	9.6
07JUL76	1020	36.3	100	100	69.8	1.44	5.0	5123	29.6	9.6
07JUL76	1615	38.5	100	100	79.2	1.51	5.1	5123	29.6	10.0
08JUL76	1000	36.1	100	100	78.9	1.84	6.6	3736	23.1	10.0
08JUL76	1530	40.1	100	100	75.7	1.33	5.3	3736	23.1	8.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
02JUN76	.	.	.	.	.	32	18	20	24	25	0.0
07JUN76	.	.	.	.	.	31	8	16	27	22	5.8
09JUN76	.	.	.	.	.	37	12	21	30	23	5.8
09JUN76	.	.	.	.	.	37	12	21	30	29	5.8
15JUN76	.	.	.	.	.	36	16	22	28	26	6.0
15JUN76	.	.	.	.	.	36	16	22	28	27	6.0
16JUN76	.	.	.	.	.	34	21	22	28	26	6.0
16JUN76	.	.	.	.	.	34	21	22	28	27	6.0
17JUN76	.	.	.	.	.	32	16	20	21	25	6.0
22JUN76	.	.	.	.	.	30	19	22	27	25	16.3
22JUN76	.	.	.	.	.	30	19	22	27	26	16.3
23JUN76	.	.	.	.	.	31	18	21	28	25	16.3
24JUN76	.	.	.	.	.	33	17	20	23	25	16.3
24JUN76	.	.	.	.	.	33	17	20	23	26	16.3
01JUL76	.	.	.	.	.	33	19	20	28	26	0.0
06JUL76	.	.	.	.	.	36	17	19	22	24	3.9
06JUL76	.	.	.	.	.	36	17	19	22	25	3.9
07JUL76	.	.	.	.	.	23	16	20	22	24	4.6
07JUL76	.	.	.	.	.	23	16	20	22	25	4.6
08JUL76	.	.	.	.	.	34	17	20	26	25	4.6
08JUL76	.	.	.	.	.	34	17	20	26	26	4.6

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
12JUL76	1500	29.1	100	100	72.7	1.76	5.2	.	.	.
14JUL76	1000	26.6	100	100	71.5	1.52	5.2	5756	29.6	9.3
15JUL76	1030	17.9	100	100	83.4	2.83	5.6	5327	29.6	10.0
19JUL76	1030	37.4	100	100	77.4	1.80	5.4	6205	29.6	9.8
19JUL76	1540	35.2	100	100	76.2	1.69	5.4	6205	29.6	9.8
20JUL76	1020	26.3	100	100	87.8	2.12	5.2	5593	29.6	10.0
21JUL76	1020	31.1	100	100	81.0	1.93	4.9	4674	29.6	10.0
21JUL76	1530	23.5	100	100	83.8	1.99	5.1	4674	29.6	10.0
27JUL76	1005	12.6	100	100	73.4	2.99	5.2	6532	29.6	10.0
27JUL76	1530	39.9	100	100	81.6	2.10	4.9	6532	29.6	10.0
28JUL76	1015	9.4	100	100	74.4	3.48	5.2	5960	29.6	9.5
28JUL76	1540	34.8	100	100	78.7	1.90	5.0	5960	29.6	9.5
29JUL76	1000	39.4	100	100	80.8	1.76	5.1	6736	29.6	9.3
29JUL76	1515	42.1	100	100	84.8	2.02	5.0	6736	29.6	9.3
03AUG76	1030	24.6	100	100	75.2	1.78	5.0	5919	29.6	10.0
03AUG76	1525	17.5	100	100	77.1	2.68	4.9	5919	29.6	10.0
04AUG76	1010	37.8	100	100	80.0	1.75	4.8	4491	29.6	9.3
04AUG76	1510	24.3	100	100	83.1	1.84	4.7	4491	29.6	9.3
05AUG76	1000	14.0	100	100	86.9	3.21	5.0	5548	29.6	10.0
05AUG76	1500	13.7	100	100	81.7	2.75	4.9	5548	29.6	10.0
09AUG76	1000	17.1	100	100	88.5	2.65	5.2	5327	29.6	9.3

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
12JUL76	.	.	.	.	.	.	.	.	.	28	4.6
14JUL76	.	.	.	.	.	36	18	16	27	26	4.6
15JUL76	.	.	.	.	.	36	18	23	32	28	4.6
19JUL76	.	.	.	.	.	37	19	20	26	27	7.7
19JUL76	.	.	.	.	.	37	19	20	26	28	7.7
20JUL76	.	.	.	.	.	33	20	23	29	28	7.7
21JUL76	.	.	.	.	.	36	22	24	31	28	7.7
21JUL76	.	.	.	.	.	36	22	24	31	30	7.7
27JUL76	.	.	.	.	.	37	22	21	26	28	7.7
27JUL76	.	.	.	.	.	37	22	21	26	29	7.7
28JUL76	.	.	.	.	.	37	21	23	30	28	7.7
28JUL76	.	.	.	.	.	37	21	23	30	28	7.7
29JUL76	.	.	.	.	.	37	21	24	30	28	7.7
29JUL76	.	.	.	.	.	37	21	24	30	29	7.7
03AUG76	.	.	.	.	.	29	16	16	20	25	0.6
03AUG76	.	.	.	.	.	29	16	16	20	25	0.6
04AUG76	.	.	.	.	.	27	16	17	22	24	0.6
04AUG76	.	.	.	.	.	27	16	17	22	26	0.6
05AUG76	.	.	.	.	.	32	16	17	29	24	0.6
05AUG76	.	.	.	.	.	32	16	17	29	26	0.6
09AUG76	.	.	.	.	.	31	18	20	23	24	3.1

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
09AUG76	1500	30.7	100	100	83.4	2.09	5.1	5327	29.6	9.3
10AUG76	1000	20.3	100	100	81.5	2.31	5.2	5859	29.6	9.7
10AUG76	1500	14.9	100	100	81.7	2.69	5.2	5859	29.6	9.7
11AUG76	1015	20.8	100	100	82.5	2.24	5.3	4864	29.6	10.0
16AUG76	1000	34.4	100	100	85.6	2.26	5.1	5614	29.6	9.1
16AUG76	1500	30.9	100	100	83.7	1.91	5.1	5614	29.6	9.1
17AUG76	1000	18.9	100	100	78.4	2.50	5.2	6328	29.6	10.0
17AUG76	1500	6.6	100	100	84.1	0.90	5.4	6328	29.6	10.0
18AUG76	1100	18.5	100	100	77.0	2.00	5.3	3756	26.5	7.0
18AUG76	1525	25.7	100	100	75.7	2.07	5.5	3756	26.5	7.0
24AUG76	1015	33.2	100	100	80.9	2.20	5.2	5614	29.6	9.1
25AUG76	1530	41.4	100	100	77.4	2.20	5.0	5838	29.6	9.4
26AUG76	1505	22.4	100	100	74.0	2.22	5.2	4716	29.6	10.0
01SEP76	1000	36.4	100	100	79.9	2.53	4.9	4246	29.6	9.3
01SEP76	1520	19.2	100	100	90.1	3.13	5.2	4246	29.6	9.3
07SEP76	1030	45.8	100	100	71.4	1.72	5.1	5042	29.6	10.0
07SEP76	1530	42.6	100	100	77.5	2.14	5.1	5042	29.6	10.0
08SEP76	1030	16.7	100	99	81.1	1.95	5.1	5838	29.6	10.0
08SEP76	1530	21.6	100	100	84.8	2.14	5.1	5838	29.6	10.0
09SEP76	1000	31.6	100	100	79.8	2.04	5.0	6104	29.6	10.0
09SEP76	1500	8.4	100	100	79.0	2.60	5.2	6104	29.6	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
09AUG76	.	.	.	.	.	31	18	20	23	25	3.1
10AUG76	.	.	.	.	.	32	18	17	24	24	3.1
10AUG76	.	.	.	.	.	32	18	17	24	27	3.1
11AUG76	.	.	.	.	.	33	18	18	26	26	3.1
16AUG76	.	.	.	.	.	32	19	22	26	27	6.3
16AUG76	.	.	.	.	.	32	19	22	26	28	6.3
17AUG76	.	.	.	.	.	28	20	17	23	26	6.3
17AUG76	.	.	.	.	.	28	20	17	23	27	6.3
18AUG76	.	.	.	.	.	29	17	17	22	26	6.3
18AUG76	.	.	.	.	.	29	17	17	22	26	6.3
24AUG76	.	.	.	.	.	33	20	24	28	26	7.4
25AUG76	.	.	.	.	.	34	20	23	32	28	7.4
26AUG76	.	.	.	.	.	34	19	22	31	29	7.4
01SEP76	.	.	.	.	.	29	12	18	22	24	0.0
01SEP76	.	.	.	.	.	29	12	18	22	26	0.0
07SEP76	.	.	.	.	.	29	16	17	23	24	0.8
07SEP76	.	.	.	.	.	29	16	17	23	25	0.8
08SEP76	.	.	.	.	.	31	13	16	22	24	0.8
08SEP76	.	.	.	.	.	31	13	16	22	25	0.8
09SEP76	.	.	.	.	.	.	20	21	23	25	0.8
09SEP76	.	.	.	.	.	.	20	21	23	26	0.8

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
13SEP76	1000	44.5	100	100	79.2	2.04	5.3	5490	29.6	9.1
13SEP76	1530	34.4	100	100	74.6	1.98	5.2	5490	29.6	9.1
14SEP76	1015	37.9	100	100	76.1	1.91	5.2	4790	29.6	10.0
14SEP76	1520	33.9	100	100	76.1	1.87	5.2	4790	29.6	10.0
15SEP76	945	37.0	100	100	81.2	2.49	5.7	5511	29.6	10.0
15SEP76	1530	36.7	100	100	76.5	2.10	5.3	5511	29.6	10.0
20SEP76	1010	27.6	100	100	80.0	1.56	5.3	5777	29.6	10.0
20SEP76	1520	6.8	100	100	77.7	1.53	5.8	5777	29.6	10.0
21SEP76	1005	14.4	100	100	73.3	2.81	5.3	6058	29.6	10.0
21SEP76	1530	12.4	100	100	73.3	2.44	5.2	6058	29.6	10.0
22SEP76	955	0.0	100	100	.	3.35	5.3	5654	28.0	9.5
22SEP76	1530	21.1	100	100	82.1	2.22	5.1	5654	28.0	9.5
27SEP76	1000	12.1	100	100	88.5	3.29	5.3	5103	29.6	10.0
27SEP76	1500	42.9	100	100	84.1	2.05	5.3	5103	29.6	10.0
28SEP76	1000	37.8	100	100	79.8	1.89	5.2	5144	29.6	10.0
28SEP76	1500	38.5	100	100	85.6	2.37	5.1	5144	29.6	10.0
29SEP76	1000	31.2	100	100	86.4	2.13	5.1	6430	29.6	9.8
29SEP76	1500	14.2	100	100	77.5	3.03	5.2	6430	29.6	9.8
04OCT76	1005	32.7	100	100	81.7	2.26	5.1	7357	29.6	10.0
04OCT76	1520	30.2	100	100	84.2	2.66	5.1	7357	29.6	10.0
05OCT76	1015	23.6	100	100	85.0	2.33	5.1	5735	27.7	9.3

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
13SEP76	.	.	.	.	.	29	14	18	22	26	1.0
13SEP76	.	.	.	.	.	29	14	18	22	24	1.0
14SEP76	.	.	.	.	.	22	18	16	18	22	1.0
14SEP76	.	.	.	.	.	22	18	16	18	22	1.0
15SEP76	.	.	.	.	.	29	18	19	21	22	3.6
15SEP76	.	.	.	.	.	29	18	19	21	24	3.6
20SEP76	.	.	.	.	.	31	14	19	23	23	3.6
20SEP76	.	.	.	.	.	31	14	19	23	23	3.6
21SEP76	.	.	.	.	.	31	20	19	21	24	5.3
21SEP76	.	.	.	.	.	31	20	19	21	24	5.3
22SEP76	.	.	.	.	.	29	12	12	19	23	5.3
22SEP76	.	.	.	.	.	29	12	12	19	24	5.3
27SEP76	.	.	.	.	.	30	10	21	24	23	8.9
27SEP76	.	.	.	.	.	30	10	21	24	24	8.9
28SEP76	.	.	.	.	.	29	21	18	21	24	8.9
28SEP76	.	.	.	.	.	29	21	18	21	24	8.9
29SEP76	.	.	.	.	.	24	19	16	18	23	8.9
29SEP76	.	.	.	.	.	24	19	16	18	23	8.9
04OCT76	.	.	.	.	.	29	12	14	18	21	0.0
04OCT76	.	.	.	.	.	29	12	14	18	22	0.0
05OCT76	.	.	.	.	.	24	11	13	16	20	0.0

MINE=BONSAL

DATE	TIME	CONC	P10	P40	P200	FES	PH	ORE	WASH	HRS
05OCT76	1520	24.9	100	100	86.0	2.36	5.1	5735	27.7	9.3
06OCT76	1015	26.3	100	100	82.5	1.81	5.0	6757	29.6	10.0
06OCT76	1525	21.3	100	100	83.2	1.99	5.0	6757	29.6	10.0
12OCT76	1030	28.2	100	100	84.0	1.86	5.0	5103	29.6	10.0
18OCT76	1015	15.1	100	100	77.6	2.36	5.5	6920	29.6	9.3
19OCT76	1030	32.5	100	100	81.4	2.09	5.1	6083	29.6	9.3
19OCT76	1507	17.8	100	100	74.1	2.03	5.1	6083	29.6	9.3
20OCT76	1000	22.5	100	100	85.6	2.34	5.0	6225	29.6	10.0
20OCT76	1505	17.9	100	100	75.1	1.98	5.0	6225	29.6	10.0
25OCT76	1030	26.1	100	100	81.0	2.03	4.9	5164	29.6	9.5
25OCT76	1530	29.4	100	100	78.5	2.00	4.9	5164	29.6	9.5
26OCT76	1000	13.8	100	100	75.5	2.49	5.0	7144	29.6	9.5
28OCT76	1010	40.0	100	100	74.9	1.92	5.1	7103	29.6	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
05OCT76	.	.	.	.	.	24	11	13	16	21	0.0
06OCT76	.	.	.	.	.	27	11	18	26	21	0.0
06OCT76	.	.	.	.	.	27	11	18	26	22	0.0
12OCT76	.	.	.	.	.	29	5	9	13	18	2.8
18OCT76	.	.	.	.	.	27	2	2	6	10	3.9
19OCT76	.	.	.	.	.	14	2	5	10	14	3.9
19OCT76	.	.	.	.	.	14	2	5	10	15	3.9
20OCT76	.	.	.	.	.	18	9	9	10	13	3.9
20OCT76	.	.	.	.	.	18	9	9	10	15	3.9
25OCT76	.	.	.	.	.	20	0	16	19	15	9.6
25OCT76	.	.	.	.	.	20	0	16	19	16	9.6
26OCT76	.	.	.	.	.	21	13	10	15	17	9.6
28OCT76	.	.	.	.	.	18	-1	-1	4	12	9.6

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
09FEB76	.	26.3	100	100	88.3	2.51	5.0	.	.	.
11FEB76	1025	.	.	.	.	.	.	4082	.	5.0
11FEB76	1400	.	.	.	.	.	.	.	.	.
13FEB76	1025	.	.	.	.	.	.	4173	.	5.1
13FEB76	1400	.	.	.	.	.	.	.	.	.
16FEB76	1100	.	.	.	.	.	.	1950	.	2.4
16FEB76	1400	.	.	.	.	.	.	.	.	.
18FEB76	1000	.	.	.	.	.	.	4264	.	5.2
18FEB76	1430	.	.	.	.	.	.	.	.	.
19FEB76	1000	.	.	.	.	.	.	1950	.	2.4
19FEB76	1530	.	.	.	.	.	.	.	.	.
23FEB76	1000	.	.	.	.	.	.	1996	.	2.4
23FEB76	1500	.	.	.	.	.	.	.	.	.
10MAR76	1000	32.7	99	84	57.5	0.90	5.9	3475	.	4.3
10MAR76	1615	108.5	76	42	25.7	1.11	5.7	.	.	.
11MAR76	1145	90.5	91	36	23.0	0.61	5.5	.	.	.
11MAR76	.	325.0	86	6	0.1	0.14	5.9	.	.	.
15MAR76	1015	261.9	95	16	5.4	0.16	5.2	.	.	.
15MAR76	1530	149.9	94	40	28.3	0.20	5.3	.	.	.
17MAR76	1045	186.1	75	18	7.6	0.25	5.0	2404	.	2.9
18MAR76	1045	263.3	84	27	20.4	0.12	4.9	3130	.	3.8

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
09FEB76	-26.1	20	-.260	312	140	.	.	.	.	9	.
11FEB76	.	.	.	.	.	20	11	16	23	10	.
11FEB76	.	.	.	.	.	.	.	.	.	10	.
13FEB76	.	.	.	.	.	17	6	11	17	9	.
13FEB76	.	.	.	.	.	.	.	.	.	9	.
16FEB76	.	.	.	.	.	23	2	17	23	12	.
16FEB76	.	.	.	.	.	.	.	.	.	14	.
18FEB76	.	.	.	.	.	26	14	16	24	15	.
18FEB76	.	.	.	.	.	.	.	.	.	15	.
19FEB76	.	.	.	.	.	24	11	12	22	15	.
19FEB76	.	.	.	.	.	.	.	.	.	15	.
23FEB76	.	.	.	.	.	10	1	4	11	12	.
23FEB76	.	.	.	.	.	.	.	.	.	13	.
10MAR76	-69.0	10	-.038	134	120	15	2	9	15	12	0.0
10MAR76	-16.8	24	-.264	478	120	.	.	.	.	14	.
11MAR76	-31.0	17	-.154	267	120	23	1	14	21	13	0.0
11MAR76	-15.8	30	-.240	479	120	.	.	.	.	14	.
15MAR76	-32.2	16	-.256	301	120	17	3	9	14	13	0.0
15MAR76	-15.3	26	-.216	475	120	.	.	.	.	13	.
17MAR76	-16.9	20	-.231	436	120	.	.	.	.	10	.
18MAR76	-22.8	24	-.192	361	120	.	.	.	.	11	.

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
23MAR76	1015	501.6	46	24	19.6	.	4.8	3130	.	6.0
23MAR76	1530	467.5	20	25	16.5	.	5.0	3130	.	6.0
24MAR76	1045	86.4	92	59	36.7	0.67	4.7	.	.	.
25MAR76	1030	84.4	91	62	40.0	0.70	4.6	.	.	.
25MAR76	1445	372.5	78	27	18.6	0.14	4.7	.	.	.
30MAR76	1430	421.3	71	43	38.5	0.07	5.3	.	.	.
31MAR76	1030	698.4	84	16	6.8	0.05	5.1	.	.	.
03APR76	1100	168.9	86	26	18.6	0.18	5.0	.	.	.
06APR76	1138	609.0	90	40	35.6	1.17	5.7	.	.	.
06APR76	1615	225.2	95	40	28.2	1.17	5.0	.	.	.
07APR76	1050	28.2	100	95	81.5	1.17	5.0	.	.	.
08APR76	1000	441.4	85	34	30.1	1.17	5.2	2268	.	8.0
08APR76	1530	540.0	77	38	35.3	1.14	5.3	2268	.	8.0
13APR76	1100	36.3	100	85	58.8	1.14	5.4	3856	.	8.0
13APR76	1400	319.8	92	51	43.1	1.14	6.5	3856	.	8.0
14APR76	1000	786.4	78	5	2.9	1.14	6.2	4082	.	8.0
14APR76	1345	164.6	88	23	12.9	0.93	5.8	4082	.	8.0
15APR76	930	574.6	76	18	15.6	0.93	6.5	3538	.	8.0
15APR76	1430	661.0	61	.	0.0	0.93	6.1	3538	.	8.0
20APR76	1130	752.3	60	2	1.5	0.93	6.4	.	.	.
28APR76	1010	69.4	92	45	33.8	1.77	6.5	4264	.	8.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
23MAR76	.	.	.	.	.	23	-1	9	18	.	0.0
23MAR76	.	.	.	.	.	23	-1	9	18	14	0.0
24MAR76	.	.	.	.	.	.	.	.	.	14	.
25MAR76	.	.	.	.	.	22	2	16	22	15	0.3
25MAR76	.	.	.	.	.	22	2	16	22	16	0.3
30MAR76	.	.	.	.	.	18	4	14	17	16	1.3
31MAR76	.	.	.	.	.	.	.	.	.	17	1.3
03APR76	.	.	.	.	.	.	.	.	.	17	.
06APR76	.	.	.	.	.	26	2	13	23	16	.
06APR76	.	.	.	.	.	26	2	13	23	17	.
07APR76	.	.	.	.	.	.	.	.	.	17	.
08APR76	.	.	.	.	.	24	7	16	24	15	.
08APR76	.	.	.	.	.	24	7	16	24	16	.
13APR76	.	.	.	.	.	28	1	13	24	15	.
13APR76	.	.	.	.	.	28	1	13	24	16	.
14APR76	.	.	.	.	.	30	8	13	27	16	.
14APR76	.	.	.	.	.	30	8	13	27	18	.
15APR76	.	.	.	.	.	32	11	17	27	18	.
15APR76	.	.	.	.	.	32	11	17	27	19	.
20APR76	.	.	.	.	.	.	.	.	.	21	.
28APR76	.	.	.	.	.	23	3	12	23	21	.

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
28APR76	1520	104.8	88	26	17.7	1.77	6.2	4264	.	8.0
29APR76	930	206.8	79	5	2.2	1.77	6.1	.	.	9.0
29APR76	1530	468.4	80	1	0.0	1.77	.	.	.	9.0
04MAY76	1100	335.5	89	27	19.0	1.20	6.2	4627	.	9.0
04MAY76	1430	679.4	86	34	31.1	1.20	.	4627	.	9.0
05MAY76	1000	841.2	80	4	0.4	1.20	6.3	4264	.	8.0
05MAY76	1500	319.2	86	4	0.0	1.20	6.2	4264	.	8.0
06MAY76	1000	492.0	90	0	0.0	1.42	6.3	3720	.	7.5
06MAY76	1400	347.0	94	2	0.0	1.42	6.1	3720	.	7.5
11MAY76	1000	752.8	90	28	23.4	1.42	6.2	3856	.	7.5
11MAY76	1430	785.0	83	8	2.0	1.42	6.5	3856	.	7.5
12MAY76	1000	323.0	83	0	0.0	1.99	6.2	3992	.	8.5
12MAY76	1400	619.6	95	55	50.5	1.99	6.5	3992	.	8.5
13MAY76	1000	575.2	82	0	0.0	1.99	.	4173	.	9.5
13MAY76	1500	341.4	94	14	5.0	1.99	6.5	4173	.	9.5
18MAY76	1000	592.2	86	1	0.0	.	6.0	4309	.	9.5
18MAY76	1430	483.4	92	5	0.0	.	6.1	4309	.	9.5
19MAY76	1000	270.2	84	5	0.0	.	6.4	3856	.	8.0
19MAY76	1500	365.8	48	3	0.0	.	6.5	3856	.	8.0
20MAY76	1000	763.4	88	21	15.9	.	6.4	.	.	.
26MAY76	1030	26.6	98	73	42.8	.	5.4	726	.	8.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
28APR76	.	.	.	.	.	23	3	12	23	19	.
29APR76	.	.	.	.	.	23	5	11	21	19	.
29APR76	.	.	.	.	.	23	5	11	21	21	.
04MAY76	.	.	.	.	.	28	8	13	22	19	2.5
04MAY76	.	.	.	.	.	28	8	13	22	21	2.5
05MAY76	.	.	.	.	.	26	6	13	24	19	2.5
05MAY76	.	.	.	.	.	26	6	13	24	21	2.5
06MAY76	.	.	.	.	.	27	13	17	26	20	2.5
06MAY76	.	.	.	.	.	27	13	17	26	21	2.5
11MAY76	.	.	.	.	.	29	6	19	23	20	4.4
11MAY76	.	.	.	.	.	29	6	19	23	21	4.4
12MAY76	.	.	.	.	.	31	14	17	24	21	5.0
12MAY76	.	.	.	.	.	31	14	17	24	22	5.0
13MAY76	.	.	.	.	.	30	18	20	24	22	5.0
13MAY76	.	.	.	.	.	30	18	20	24	23	5.0
18MAY76	.	.	.	.	.	26	18	17	24	23	5.1
18MAY76	.	.	.	.	.	26	18	17	24	23	5.1
19MAY76	.	.	.	.	.	27	7	12	22	20	5.1
19MAY76	.	.	.	.	.	27	7	12	22	21	5.1
20MAY76	.	.	.	.	.	.	.	.	.	20	5.1
26MAY76	.	.	.	.	.	36	11	17	24	20	5.8

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
26MAY76	1400	232.0	74	22	15.1	.	6.6	726	.	8.0
27MAY76	1000	555.6	80	14	7.0	.	4.7	4405	.	8.0
27MAY76	1400	472.0	94	66	60.7	.	5.2	4405	.	8.0
28MAY76	1000	576.3	62	19	11.4	.	5.4	.	.	.
11JUN76	1000	701.5	94	10	0.4	1.13	6.0	4264	.	8.0
11JUN76	1430	476.0	94	29	22.0	1.13	5.3	4264	.	8.0
15JUN76	1000	684.5	92	13	6.1	1.13	5.1	4309	.	8.0
15JUN76	1430	165.7	83	14	2.7	1.13	5.1	4309	.	8.5
16JUN76	1000	96.4	91	51	31.8	1.80	5.0	4264	.	8.5
16JUN76	1430	47.1	99	75	40.2	1.80	5.0	4264	.	8.5
17JUN76	1100	.	.	.	.	1.80	5.2	4264	.	8.5
17JUN76	1500	42.2	99	84	60.1	1.80	5.6	4264	.	8.5
22JUN76	1000	102.6	87	35	19.7	1.40	4.9	4128	.	8.5
22JUN76	1400	25.4	100	90	65.5	1.40	5.0	4128	.	8.5
23JUN76	1000	183.1	89	49	35.7	1.40	5.2	3992	.	8.0
23JUN76	1530	39.3	100	98	74.2	1.40	4.8	3992	.	8.0
24JUN76	1100	443.0	76	23	17.5	1.73	5.3	3493	.	7.0
24JUN76	1500	25.7	100	94	67.4	1.73	5.0	3493	.	7.0
29JUN76	1000	30.5	100	96	65.5	1.73	4.9	4672	.	9.5
29JUN76	1630	43.3	100	93	61.3	1.73	5.0	4672	.	9.5
30JUN76	1000	27.8	100	95	66.5	1.21	5.0	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
26MAY76	.	.	.	.	.	36	11	17	24	21	5.8
27MAY76	.	.	.	.	.	29	11	17	22	21	5.8
27MAY76	.	.	.	.	.	29	11	17	22	22	5.8
28MAY76	.	.	.	.	.	.	.	.	.	22	5.8
11JUN76	.	.	.	.	.	37	18	20	26	24	8.9
11JUN76	.	.	.	.	.	37	18	20	26	25	8.9
15JUN76	.	.	.	.	.	37	18	20	26	24	8.9
15JUN76	.	.	.	.	.	37	18	19	25	26	10.2
16JUN76	.	.	.	.	.	31	18	19	25	25	11.7
16JUN76	.	.	.	.	.	31	21	20	26	26	11.7
17JUN76	.	.	.	.	.	29	19	.	.	25	15.5
17JUN76	.	.	.	.	.	29	19	18	24	25	15.5
22JUN76	.	.	.	.	.	30	21	18	22	25	19.3
22JUN76	.	.	.	.	.	30	21	18	22	25	19.3
23JUN76	.	.	.	.	.	32	17	18	21	25	19.3
23JUN76	.	.	.	.	.	32	17	18	21	26	19.3
24JUN76	.	.	.	.	.	32	18	23	29	25	19.3
24JUN76	.	.	.	.	.	32	18	23	29	26	19.3
29JUN76	.	.	.	.	.	37	20	19	24	25	21.1
29JUN76	.	.	.	.	.	37	20	19	24	27	21.1
30JUN76	.	.	.	.	.	37	21	19	24	25	21.1

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
30JUN76	1400	59.2	100	93	59.2	1.21	5.1	.	.	.
01JUL76	1000	27.5	100	91	58.2	1.21	5.1	4854	.	8.5
01JUL76	1400	429.9	84	32	24.8	1.21	5.2	4854	.	8.5
13JUL76	1000	33.7	100	96	71.0	1.21	5.6	4445	.	9.0
13JUL76	1400	21.0	100	98	75.7	1.79	5.7	4445	.	9.0
14JUL76	1000	111.7	41	17	15.3	3.46	6.1	4717	.	9.5
14JUL76	1430	412.5	.	.	.	3.46	6.0	4717	.	9.5
16JUL76	1000	157.3	79	19	7.4	3.46	5.8	3039	.	7.5
16JUL76	1430	972.3	49	3	1.0	.	.	3039	.	7.5
20JUL76	1400	18.1	100	99	81.7	1.07	5.9	4309	.	7.5
20JUL76	1030	999.9	50	3	1.0	.	.	4309	.	7.5
21JUL76	1000	33.4	100	98	62.3	1.28	5.7	4309	.	7.5
21JUL76	1300	14.1	100	97	70.9	1.73	6.6	4309	.	7.5
22JUL76	1100	18.2	100	99	82.3	2.05	6.0	3266	.	7.0
22JUL76	1430	28.2	100	99	74.2	1.65	5.7	3266	.	7.0
27JUL76	1000	31.0	100	92	67.2	1.65	5.9	3810	.	7.5
27JUL76	1430	28.1	100	99	77.7	1.65	6.2	3810	.	7.5
29JUL76	1000	21.2	100	100	73.4	.	6.4	1542	.	4.0
29JUL76	1430	22.3	100	100	72.7	.	6.3	1542	.	4.0
04AUG76	1000	26.4	100	100	78.0	1.45	6.2	0	.	0.0
10AUG76	1000	83.6	100	97	80.8	0.62	6.2	2631	.	5.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
30JUN76	.	.	.	.	.	37	21	19	24	26	21.1
01JUL76	.	.	.	.	.	35	21	19	24	25	0.0
01JUL76	.	.	.	.	.	35	21	19	24	26	0.0
13JUL76	.	.	.	.	.	37	18	17	26	26	0.0
13JUL76	.	.	.	.	.	37	18	17	26	28	0.0
14JUL76	.	.	.	.	.	35	14	16	25	25	0.0
14JUL76	.	.	.	.	.	35	14	16	25	27	0.0
16JUL76	.	.	.	.	.	33	22	21	29	29	0.0
16JUL76	.	.	.	.	.	33	22	21	29	29	.
20JUL76	.	.	.	.	.	36	11	19	26	28	0.0
20JUL76	.	.	.	.	.	36	11	19	26	26	.
21JUL76	.	.	.	.	.	37	10	19	24	26	0.0
21JUL76	.	.	.	.	.	37	10	19	24	26	0.0
22JUL76	.	.	.	.	.	37	22	21	28	28	0.0
22JUL76	.	.	.	.	.	37	22	21	28	29	0.0
27JUL76	.	.	.	.	.	33	21	20	24	27	2.0
27JUL76	.	.	.	.	.	33	21	20	24	28	2.0
29JUL76	.	.	.	.	.	37	23	20	26	27	2.0
29JUL76	.	.	.	.	.	37	23	20	26	29	2.0
04AUG76	.	.	.	.	.	**	**	**	**	24	0.0
10AUG76	.	.	.	.	.	37	14	17	21	25	3.6

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
10AUG76	1430	17.3	100	98	74.4	1.63	6.8	2631	.	5.0
11AUG76	1000	27.4	100	99	69.6	1.20	6.3	.	.	.
12AUG76	1400	46.3	100	96	71.8	1.07	6.1	2994	.	7.5
18AUG76	1000	43.9	100	100	79.5	1.23	6.1	.	.	.
19AUG76	1000	34.3	100	100	81.2	1.53	6.5	3765	.	8.0
19AUG76	1400	49.5	100	88	67.1	1.90	6.0	3765	.	8.0
20AUG76	1000	27.2	100	98	76.7	2.48	6.6	.	.	.
23AUG76	1030	576.2	57	7	2.0	.	6.4	.	.	.
24AUG76	.	20.7	100	95	70.8	3.90	6.8	.	.	.
25AUG76	1000	999.9	43	2	1.0	.	5.8	1814	.	4.5
25AUG76	1400	530.0	48	9	6.0	.	6.1	1814	.	4.5
30AUG76	1030	47.5	97	87	67.5	1.29	5.8	2268	.	5.0
30AUG76	1400	459.1	.	.	.	.	6.3	2268	.	5.0
31AUG76	1000	16.5	100	95	68.2	1.33	6.9	3402	.	7.5
31AUG76	1400	42.1	100	100	75.8	1.23	6.2	3402	.	7.5
02SEP76	1000	726.8	93	78	75.7	.	6.6	3674	.	7.5
02SEP76	1400	560.0	.	.	.	.	6.5	3674	.	7.5
08SEP76	1000	999.9	66	4	1.0	.	5.8	.	.	.
09SEP76	1000	61.4	100	98	67.3	1.22	6.1	4536	.	8.0
09SEP76	1430	32.9	100	100	75.4	2.51	6.3	4536	.	8.0
13SEP76	1000	173.9	79	39	33.0	0.27	6.5	2041	.	4.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
10AUG76	.	.	.	.	.	37	14	17	21	26	3.6
11AUG76	.	.	.	.	.	.	.	.	.	25	3.6
12AUG76	.	.	.	.	.	36	18	14	20	27	3.6
18AUG76	.	.	.	.	.	.	.	.	.	25	3.6
19AUG76	.	.	.	.	.	33	13	13	19	24	3.6
19AUG76	.	.	.	.	.	33	13	13	19	26	3.6
20AUG76	.	.	.	.	.	.	.	.	.	23	3.6
23AUG76	.	.	.	.	.	.	.	.	.	24	5.5
24AUG76	.	.	.	.	.	.	.	.	.	26	5.5
25AUG76	.	.	.	.	.	32	18	18	22	26	7.4
25AUG76	.	.	.	.	.	32	18	18	22	27	7.4
30AUG76	.	.	.	.	.	37	20	14	21	25	7.4
30AUG76	.	.	.	.	.	37	20	14	21	26	7.4
31AUG76	.	.	.	.	.	29	11	14	21	23	7.4
31AUG76	.	.	.	.	.	29	11	14	21	25	7.4
02SEP76	.	.	.	.	.	33	12	15	21	23	0.0
02SEP76	.	.	.	.	.	33	12	15	21	24	.
08SEP76	.	.	.	.	.	.	.	.	.	21	.
09SEP76	.	.	.	.	.	37	11	18	22	22	.
09SEP76	.	.	.	.	.	37	11	18	22	24	.
13SEP76	.	.	.	.	.	32	10	.	.	20	2.0

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
13SEP76	1430	446.6	56	31	29.6	.	6.6	2041	.	4.0
14SEP76	1000	814.6	79	36	31.8	.	6.8	2948	.	5.0
14SEP76	1430	640.2	78	61	58.5	.	6.8	2948	.	5.0
15SEP76	1000	999.9	37	2	1.0	.	5.9	4990	.	9.0
15SEP76	1400	630.8	88	60	57.2	.	6.8	4990	.	9.0
21SEP76	1000	37.5	99	90	65.5	1.13	6.5	.	.	.
22SEP76	1000	182.7	.	.	.	0.22	6.7	.	.	.
24SEP76	1000	83.4	100	86	55.8	1.02	6.2	3175	.	6.0
24SEP76	1400	33.5	100	97	72.5	1.60	6.0	3175	.	6.0
27SEP76	1000	549.8	77	45	41.8	1.77	6.2	.	.	.
28SEP76	1000	50.6	100	97	71.5	1.66	6.0	.	.	.
29SEP76	1000	30.9	100	99	73.9	2.15	6.1	1814	.	4.5
29SEP76	1330	31.6	100	99	74.6	2.11	6.1	1814	.	4.5
04OCT76	1000	44.0	80	40	30.6	1.09	6.7	3538	.	7.0
04OCT76	1430	417.5	70	7	3.0	.	6.8	3538	.	7.0
05OCT76	1000	379.4	57	9	5.0	.	.	.	.	.
06OCT76	1000	428.6	61	15	5.0	.	6.7	.	.	.
07OCT76	1430	422.5	60	10	5.0	.	6.6	2268	.	5.0
14OCT76	1000	53.7	99	93	65.4	1.37	5.3	2177	.	7.0
14OCT76	1400	32.5	100	99	73.6	1.34	5.4	2177	.	7.0
18OCT76	1000	26.7	100	100	81.8	1.98	5.2	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
13SEP76	.	.	.	.	.	32	10	.	.	22	2.0
14SEP76	.	.	.	.	.	29	18	.	.	21	2.0
14SEP76	.	.	.	.	.	29	18	.	.	21	2.0
15SEP76	.	.	.	.	.	26	20	.	.	20	5.8
15SEP76	.	.	.	.	.	26	20	.	.	22	5.8
21SEP76	.	.	.	.	.	.	.	.	.	22	7.6
22SEP76	.	.	.	.	.	.	.	.	.	21	7.6
24SEP76	.	.	.	.	.	30	19	.	.	21	7.6
24SEP76	.	.	.	.	.	30	19	.	.	22	7.6
27SEP76	.	.	.	.	.	.	.	.	.	22	7.6
28SEP76	.	.	.	.	.	.	.	.	.	22	8.9
29SEP76	.	.	.	.	.	32	13	.	.	22	8.9
29SEP76	.	.	.	.	.	32	13	.	.	22	8.9
04OCT76	.	.	.	.	.	26	13	.	.	22	0.0
04OCT76	.	.	.	.	.	26	13	.	.	22	0.0
05OCT76	.	.	.	.	.	.	.	.	.	19	.
06OCT76	.	.	.	.	.	.	.	.	.	19	.
07OCT76	.	.	.	.	.	29	10	20	24	20	5.3
14OCT76	.	.	.	.	.	24	11	16	23	.	3.8
14OCT76	.	.	.	.	.	24	11	16	23	.	3.8
18OCT76	.	.	.	.	.	.	.	.	.	.	6.0

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
19OCT76	1000	24.3	100	99	87.7	1.93	5.7	2540	.	4.5
19OCT76	1430	518.2	41	6	4.0	.	6.0	2540	.	4.5
21OCT76	1000	31.7	100	100	72.8	1.46	5.3	4990	.	9.0
21OCT76	1430	35.0	99	95	71.5	1.47	5.2	4990	.	9.0
25OCT76	1030	33.7	100	99	71.5	1.46	5.1	4082	.	9.0
25OCT76	1430	30.8	100	97	69.0	1.43	5.2	4082	.	9.0
26OCT76	1000	41.3	100	99	70.6	1.39	5.2	.	.	.
27OCT76	1000	38.6	100	99	68.8	1.60	5.1	3810	.	.
27OCT76	1600	11.5	100	100	89.3	1.97	5.2	3810	.	.
01NOV76	1000	14.5	100	100	79.0	1.62	5.3	.	.	.
02NOV76	1000	60.5	100	99	64.0	1.39	5.4	.	.	.
04NOV76	1000	8.7	100	98	73.2	4.15	6.2	3493	.	6.5
04NOV76	1400	5.5	100	86	43.1	1.25	7.1	3493	.	6.5
08NOV76	1000	359.4	.	.	.	1.77	6.5	4536	.	9.0
08NOV76	1400	24.9	93	80	60.4	1.99	6.4	4536	.	9.0
09NOV76	1430	510.6	64	24	21.1	1.77	6.0	4128	.	8.0
10NOV76	1000	441.4	83	55	52.4	1.57	6.3	.	.	.
11NOV76	1000	433.7	68	7	3.0	.	6.1	2994	.	5.5
11NOV76	1430	389.1	54	10	7.0	.	5.6	2994	.	5.5
16NOV76	1000	426.2	75	39	33.4	1.57	6.3	.	.	.
18NOV76	1400	741.7	66	5	2.0	.	5.7	2994	.	5.5

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
19OCT76	.	.	.	.	.	13	2	.	.	.	11.4
19OCT76	.	.	.	.	.	13	2	.	.	.	11.4
21OCT76	.	.	.	.	.	14	4	.	.	.	16.0
21OCT76	.	.	.	.	.	14	4	.	.	.	16.0
25OCT76	.	.	.	.	.	21	2	.	.	.	16.0
25OCT76	.	.	.	.	.	21	2	.	.	.	16.0
26OCT76	.	.	.	.	.	.	.	.	.	.	16.0
27OCT76	.	.	.	.	.	16	2	.	.	.	16.0
27OCT76	.	.	.	.	.	16	2	.	.	.	16.0
01NOV76	.	.	.	.	.	.	.	.	.	.	.
02NOV76	.	.	.	.	.	.	.	.	.	.	.
04NOV76	.	.	.	.	.	21	0	.	.	.	0.8
04NOV76	.	.	.	.	.	21	0	.	.	.	0.8
08NOV76	.	.	.	.	.	14	-2	.	.	.	0.8
08NOV76	.	.	.	.	.	4	-2	.	.	.	0.8
09NOV76	.	.	.	.	.	13	-7	.	.	.	0.8
10NOV76	.	.	.	.	.	.	.	.	.	.	0.8
11NOV76	.	.	.	.	.	.	.	12	22	.	0.8
11NOV76	.	.	.	.	.	.	.	12	22	.	0.8
16NOV76	.	.	.	.	.	.	.	.	.	.	0.8
18NOV76	.	.	.	.	.	17	1	.	.	.	3.6

MINE=FIELD

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
29NOV76	1000	18.4	100	98	82.5	1.43	5.7	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
29NOV76	.	.	.	.	.	.	.	.	.	11	3.6

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
21JAN76	.	48.0	100	.	.	1.79	4.5	.	.	.
16FEB76	.	75.2	100	73	0.2	1.24	4.6	.	.	.
19FEB76	930	67.3	100	99	57.8	1.72	5.0	4536	20.5	10.0
19FEB76	1330	67.1	100	99	51.9	1.72	4.3	.	.	.
20FEB76	1000	76.7	100	97	51.2	0.96	4.5	4536	20.5	10.0
20FEB76	1330	68.4	100	99	52.2	1.43	4.5	.	.	.
23FEB76	1000	68.8	100	99	65.0	1.22	4.4	4536	20.5	10.0
23FEB76	1430	44.6	100	99	64.3	1.95	4.5	.	.	.
25FEB76	1006	22.4	100	100	77.2	2.61	5.5	4536	20.5	10.0
25FEB76	1430	60.1	100	99	59.8	1.41	4.5	.	.	.
26FEB76	1000	23.7	100	100	71.8	2.17	4.6	4536	20.5	10.0
26FEB76	1400	56.6	100	100	53.9	1.55	5.3	.	.	.
02MAR76	1000	46.6	100	100	81.0	1.77	5.3	4536	20.5	10.0
02MAR76	1430	33.8	100	100	61.8	2.16	5.1	.	.	.
03MAR76	1100	38.9	100	100	70.2	1.84	5.1	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
21JAN76	-14.6	30	-.211	404	140	.	.	.	.	6	.
16FEB76	-13.5	30	-.144	413	140	.	.	.	.	13	.
19FEB76	-13.9	33	-.394	462	140	26	15	12	20	15	0.0
19FEB76	-15.0	32	-.319	439	140	.	.	.	.	15	.
20FEB76	-10.8	34	-.319	503	140	23	12	6	14	15	0.0
20FEB76	-14.2	30	-.333	479	140	.	.	.	.	16	.
23FEB76	-17.4	25	-.298	436	140	21	3	5	12	14	0.5
23FEB76	-16.0	30	-.351	444	140	.	.	.	.	14	.
25FEB76	-26.5	21	-.266	272	140	20	2	10	17	13	0.5
25FEB76	-13.2	32	-.340	481	140	.	.	.	.	14	.
26FEB76	-29.4	18	-.277	238	140	22	6	12	15	14	0.5
26FEB76	-15.8	29	-.361	439	140	.	.	.	.	15	.
02MAR76	-13.9	31	-.380	467	140	24	9	16	19	17	0.0
02MAR76	-20.4	26	-.100	294	160	.	.	.	.	17	.
03MAR76	-17.8	28	-.193	351	145	26	10	16	23	18	0.0

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
03MAR76	1430	45.6	100	99	63.8	1.56	4.7	.	.	.
04MAR76	1000	59.9	100	99	54.4	1.18	4.5	4536	20.5	10.0
04MAR76	1430	33.7	100	100	53.7	1.86	4.6	.	.	.
08MAR76	1000	21.7	100	100	84.8	2.70	4.6	4536	20.5	10.0
08MAR76	1500	30.1	100	100	65.4	2.40	4.6	.	.	.
09MAR76	1000	17.3	100	100	75.7	2.58	4.8	4536	20.5	10.0
09MAR76	1400	59.3	100	98	50.9	1.48	4.6	.	.	.
10MAR76	1000	56.5	100	99	60.7	1.64	4.5	4536	20.5	10.0
10MAR76	1600	69.1	100	98	52.7	1.08	4.5	.	.	.
15MAR76	1000	36.0	100	99	72.5	1.86	4.5	4536	20.5	10.0
15MAR76	1400	35.9	100	99	73.5	2.41	4.5	.	.	.
16MAR76	1030	59.8	100	99	75.8	1.98	5.3	4536	20.5	10.0
16MAR76	1400	14.0	100	100	80.7	4.02	5.6	.	.	.
17MAR76	1000	33.6	100	100	80.1	2.79	5.1	4536	20.5	10.0
17MAR76	1430	26.9	100	100	81.8	3.60	4.8	.	.	.
22MAR76	1000	42.8	100	100	67.3	2.32	4.6	4536	20.5	10.0
22MAR76	1430	68.6	100	99	56.7	1.33	4.8	.	.	.
23MAR76	1000	29.1	100	99	72.2	2.10	4.6	4536	20.5	10.0
23MAR76	1430	29.3	100	100	74.7	2.45	4.6	.	.	.
24MAR76	1000	33.7	100	100	80.1	2.74	5.8	4536	20.5	10.0
24MAR76	1500	51.8	100	99	64.1	2.88	6.9	.	.	.

DATE	SI	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
03MAR76	-18.7	27	-.179	372	147	.	.	.	.	19	.
04MAR76	-18.7	27	-.187	398	146	27	14	17	21	19	0.0
04MAR76	-23.8	23	-.146	265	150	.	.	.	.	20	.
08MAR76	-32.2	16	-.102	183	157	16	5	7	14	16	2.3
08MAR76	-22.3	24	-.177	293	148	.	.	.	.	17	.
09MAR76	-39.6	12	-.070	142	160	18	8	7	9	16	3.0
09MAR76	-15.3	30	-.177	413	140	.	.	.	.	15	.
10MAR76	-12.6	32	-.153	371	150	13	2	2	4	14	3.3
10MAR76	-18.6	27	-.177	433	140	.	.	.	.	15	.
15MAR76	-16.0	29	-.203	348	140	23	6	9	13	14	4.3
15MAR76	-10.0	44	-.221	404	142	.	.	.	.	15	.
16MAR76	-10.4	50	-.571	472	110	13	5	13	13	14	8.1
16MAR76	-32.2	18	-.286	206	140	.	.	.	.	14	.
17MAR76	-20.5	26	-.286	301	140	18	2	1	7	12	8.6
17MAR76	-16.5	29	-.286	291	140	.	.	.	.	13	.
22MAR76	-10.8	40	-.429	442	115	24	8	7	13	15	8.6
22MAR76	-12.9	40	-.348	450	70	.	.	.	.	15	.
23MAR76	-23.4	25	-.313	290	70	16	3	7	15	13	8.6
23MAR76	-16.8	34	-.286	331	100	.	.	.	.	15	.
24MAR76	-11.6	36	-.286	411	80	17	4	9	19	15	8.6
24MAR76	-7.0	60	-.371	523	80	.	.	.	.	16	.

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
29MAR76	1000	47.8	100	100	54.8	1.29	5.0	4536	20.5	10.0
29MAR76	1500	69.9	100	99	54.9	1.37	4.7	.	.	.
30MAR76	1000	91.6	100	98	51.0	1.03	4.5	4536	20.5	10.0
31MAR76	1000	67.0	100	99	60.8	1.28	4.0	4536	20.5	10.0
31MAR76	1430	37.2	100	100	81.2	2.11	4.0	4536	20.5	10.0
01APR76	1000	23.2	100	100	80.8	1.97	4.0	4536	20.5	10.0
01APR76	1430	68.4	100	100	60.8	1.76	4.9	4536	20.5	10.0
05APR76	1030	76.1	100	98	51.4	1.35	4.8	4536	20.5	10.0
05APR76	1600	32.6	.	.	.	1.95	4.8	4536	20.5	10.0
06APR76	1030	29.8	100	100	80.1	2.17	5.8	4536	20.5	10.0
06APR76	1600	36.7	100	100	74.3	2.06	4.4	4536	20.5	10.0
07APR76	1000	42.3	100	100	68.0	2.13	4.5	4536	20.5	10.0
07APR76	1330	46.8	100	100	69.2	1.11	4.5	4536	20.5	10.0
12APR76	1000	31.9	100	100	80.6	1.84	4.1	4536	20.5	10.0
12APR76	1330	35.3	100	100	73.9	1.73	4.0	4536	20.5	10.0
13APR76	1000	63.1	100	99	68.4	1.19	4.2	4536	20.5	10.0
13APR76	1330	38.4	100	100	76.4	1.49	4.2	4536	20.5	10.0
14APR76	1030	52.3	100	99	69.2	1.70	4.5	4536	20.5	10.0
14APR76	1430	41.1	100	100	68.5	1.90	4.5	4536	20.5	10.0
21APR76	1000	32.3	100	100	80.8	2.42	4.4	4536	20.5	10.0
21APR76	1400	21.0	100	100	77.1	.	4.5	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
29MAR76	-16.8	30	-.286	381	80	27	12	14	20	15	8.6
29MAR76	-12.7	40	-.428	492	80	.	.	.	.	16	.
30MAR76	-12.4	20	-.514	536	80	24	15	17	21	18	10.2
31MAR76	.	.	.	.	.	23	14	16	17	18	10.2
31MAR76	.	.	.	.	.	23	14	16	17	18	10.2
01APR76	.	.	.	.	.	26	12	7	15	18	0.0
01APR76	.	.	.	.	.	26	12	7	15	18	0.0
05APR76	.	.	.	.	.	20	7	6	13	16	0.3
05APR76	.	.	.	.	.	20	7	6	13	18	0.3
06APR76	.	.	.	.	.	21	7	11	17	17	0.3
06APR76	.	.	.	.	.	21	7	11	17	18	0.3
07APR76	.	.	.	.	.	23	9	11	21	18	0.3
07APR76	.	.	.	.	.	23	9	11	21	18	0.3
12APR76	.	.	.	.	.	26	4	4	11	17	0.3
12APR76	.	.	.	.	.	26	4	4	11	17	0.3
13APR76	.	.	.	.	.	20	6	9	16	18	0.3
13APR76	.	.	.	.	.	20	6	9	16	17	0.3
14APR76	.	.	.	.	.	26	10	14	22	18	0.3
14APR76	.	.	.	.	.	26	10	14	22	18	0.3
21APR76	.	.	.	.	.	32	14	18	24	23	0.3
21APR76	.	.	.	.	.	32	14	18	24	23	0.3

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
22APR76	1000	39.4	100	100	70.6	1.97	4.5	4536	20.5	10.0
22APR76	1500	38.7	100	100	76.3	1.97	4.6	4536	20.5	10.0
23APR76	1030	46.7	100	100	73.7	2.23	3.8	4536	20.5	10.0
23APR76	1400	26.1	100	100	76.5	2.32	4.0	4536	20.5	10.0
26APR76	1000	27.6	100	100	79.8	2.73	4.0	4536	20.5	10.0
26APR76	1430	35.9	100	100	82.1	1.87	4.0	4536	20.5	10.0
28APR76	1000	16.2	99	99	87.7	1.88	3.9	4536	20.5	10.0
28APR76	1430	19.6	100	100	80.6	2.38	4.0	4536	20.5	10.0
03MAY76	1030	23.1	100	100	81.4	2.03	4.0	4536	20.5	10.0
03MAY76	1430	27.8	100	100	82.0	2.45	4.0	4536	20.5	10.0
04MAY76	1000	12.0	100	100	87.5	4.01	4.0	4536	20.5	10.0
04MAY76	1400	31.4	100	100	72.5	2.55	4.2	4536	20.5	10.0
06MAY76	1000	35.6	100	100	74.3	1.35	4.2	4536	20.5	10.0
06MAY76	1430	33.5	100	100	83.0	1.48	4.1	4536	20.5	10.0
10MAY76	1000	31.7	100	100	79.8	1.50	4.4	4536	20.5	10.0
10MAY76	1500	14.8	100	100	84.1	4.60	4.5	4536	20.5	10.0
11MAY76	930	24.0	100	100	86.7	2.81	4.6	4536	20.5	10.0
11MAY76	1430	42.6	100	100	66.0	1.99	4.7	4536	20.5	10.0
12MAY76	1000	32.8	100	100	78.4	2.29	4.8	4536	20.5	10.0
12MAY76	1430	42.2	100	100	79.8	2.17	4.6	4536	20.5	10.0
17MAY76	1030	25.9	100	100	83.0	2.37	5.0	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
22APR76	.	.	.	.	.	31	17	19	24	23	0.3
22APR76	.	.	.	.	.	31	17	19	24	23	0.3
23APR76	.	.	.	.	.	31	15	15	23	22	0.3
23APR76	.	.	.	.	.	31	15	15	23	24	0.3
26APR76	.	.	.	.	.	32	15	11	17	21	0.3
26APR76	.	.	.	.	.	32	15	11	17	22	0.3
28APR76	.	.	.	.	.	22	6	4	10	16	0.3
28APR76	.	.	.	.	.	22	6	4	10	16	0.3
03MAY76	.	.	.	.	.	28	10	14	22	20	3.6
03MAY76	.	.	.	.	.	28	10	14	22	21	3.6
04MAY76	.	.	.	.	.	28	9	6	13	19	3.6
04MAY76	.	.	.	.	.	28	9	6	13	20	3.6
06MAY76	.	.	.	.	.	21	8	16	21	21	3.6
06MAY76	.	.	.	.	.	21	8	16	21	22	3.6
10MAY76	.	.	.	.	.	29	8	11	14	18	4.1
10MAY76	.	.	.	.	.	29	8	11	14	17	4.1
11MAY76	.	.	.	.	.	26	13	17	19	19	4.1
11MAY76	.	.	.	.	.	26	13	17	19	21	4.1
12MAY76	.	.	.	.	.	23	14	16	19	20	5.1
12MAY76	.	.	.	.	.	23	14	16	19	22	5.1
17MAY76	.	.	.	.	.	31	17	19	23	23	15.7

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
17MAY76	1430	56.7	100	100	82.1	1.58	4.7	4536	20.5	10.0
19MAY76	1000	73.0	100	99	60.5	1.45	4.5	4536	20.5	10.0
19MAY76	1430	53.4	100	100	68.6	2.07	4.5	4536	20.5	10.0
20MAY76	1000	39.9	100	100	76.6	2.05	.	4536	20.5	10.0
20MAY76	1400	7.9	100	100	67.8	4.12	4.7	4536	20.5	10.0
24MAY76	1000	40.2	100	100	66.1	1.55	4.9	4536	20.5	10.0
24MAY76	1400	45.9	100	100	63.1	2.69	5.1	4536	20.5	10.0
25MAY76	1000	38.3	100	100	50.4	2.41	4.9	4536	20.5	10.0
25MAY76	1400	35.1	100	99	66.2	2.61	4.8	4536	20.5	10.0
26MAY76	1000	31.7	100	98	57.3	1.11	4.9	4536	20.5	10.0
26MAY76	1400	42.2	100	99	72.6	1.11	4.7	4536	20.5	10.0
31MAY76	1000	106.2	100	98	43.5	0.78	5.0	4536	20.5	10.0
31MAY76	1400	42.1	100	100	71.1	2.15	4.7	4536	20.5	10.0
01JUN76	1000	49.2	100	100	69.8	3.21	4.9	4536	20.5	10.0
01JUN76	1400	32.6	100	99	75.3	3.28	5.3	4536	20.5	10.0
02JUN76	1000	96.8	100	99	59.1	0.70	4.6	4536	20.5	10.0
02JUN76	1400	136.9	100	97	47.5	0.46	5.0	4536	20.5	10.0
07JUN76	1000	45.9	100	100	75.8	2.52	5.2	4536	20.5	10.0
07JUN76	1400	56.2	100	99	61.1	3.15	4.7	4536	20.5	10.0
08JUN76	1000	59.6	100	99	62.0	1.49	4.6	4536	20.5	10.0
08JUN76	1400	85.0	100	98	52.5	1.12	4.6	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
17MAY76	.	.	.	.	.	31	17	19	23	23	15.7
19MAY76	.	.	.	.	.	26	9	11	20	18	15.7
19MAY76	.	.	.	.	.	26	9	11	20	20	15.7
20MAY76	.	.	.	.	.	23	11	12	21	20	15.7
20MAY76	.	.	.	.	.	23	11	12	21	21	15.7
24MAY76	.	.	.	.	.	29	14	13	16	21	18.3
24MAY76	.	.	.	.	.	29	14	13	16	22	18.3
25MAY76	.	.	.	.	.	24	17	16	18	21	18.5
25MAY76	.	.	.	.	.	24	17	16	18	21	18.5
26MAY76	.	.	.	.	.	23	14	14	18	20	18.5
26MAY76	.	.	.	.	.	23	14	14	18	21	18.5
31MAY76	.	.	.	.	.	32	12	20	23	22	19.6
31MAY76	.	.	.	.	.	32	12	20	23	24	19.6
01JUN76	.	.	.	.	.	35	21	21	26	24	0.0
01JUN76	.	.	.	.	.	35	21	21	26	25	0.0
02JUN76	.	.	.	.	.	36	19	21	23	24	0.5
02JUN76	.	.	.	.	.	36	19	21	23	24	0.5
07JUN76	.	.	.	.	.	28	6	20	21	20	6.9
07JUN76	.	.	.	.	.	28	6	20	21	21	6.9
08JUN76	.	.	.	.	.	32	13	16	22	21	6.9
08JUN76	.	.	.	.	.	32	13	16	22	24	6.9

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
09JUN76	1000	34.3	100	100	70.4	1.88	4.7	4536	20.5	10.0
09JUN76	1400	64.0	100	99	61.6	1.38	5.0	4536	20.5	10.0
14JUN76	1000	44.2	100	100	66.0	1.54	5.0	4536	20.5	10.0
14JUN76	1400	59.2	100	100	60.7	1.75	5.7	4536	20.5	10.0
15JUN76	1000	22.3	100	100	75.7	1.86	5.6	4536	20.5	10.0
15JUN76	1400	63.7	100	97	76.3	1.13	5.2	4536	20.5	10.0
17JUN76	1000	45.2	100	97	84.8	1.81	5.0	4536	20.5	10.0
17JUN76	1400	38.0	100	100	42.7	2.91	5.1	4536	20.5	10.0
21JUN76	1000	43.5	100	100	75.9	2.56	5.1	4536	20.5	10.0
21JUN76	1400	49.6	100	100	72.4	1.57	5.3	4536	20.5	10.0
22JUN76	1000	54.4	100	100	78.1	1.82	5.1	4536	20.5	10.0
22JUN76	1400	49.9	100	99	70.5	1.86	5.0	4536	20.5	10.0
23JUN76	1000	63.2	100	98	56.6	1.71	5.2	4536	20.5	10.0
23JUN76	1430	45.8	100	100	72.7	1.71	5.1	4536	20.5	10.0
28JUN76	1000	37.3	100	100	85.3	1.67	5.5	4536	20.5	10.0
28JUN76	1400	50.4	100	99	60.9	1.41	5.0	4536	20.5	10.0
29JUN76	1000	39.5	100	100	73.6	1.45	5.0	4536	20.5	10.0
29JUN76	1430	37.0	100	100	81.8	1.54	5.0	4536	20.5	10.0
30JUN76	1000	.	.	.	.	.	5.1	4536	20.5	10.0
30JUN76	1400	82.7	100	100	56.8	1.21	5.0	4536	20.5	10.0
06JUL76	1030	32.3	100	100	78.6	1.87	5.0	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
09JUN76	.	.	.	.	.	33	19	19	26	23	6.9
09JUN76	.	.	.	.	.	33	19	19	26	21	6.9
14JUN76	.	.	.	.	.	36	14	21	24	25	6.9
14JUN76	.	.	.	.	.	36	14	21	24	25	6.9
15JUN76	.	.	.	.	.	33	20	21	24	26	6.9
15JUN76	.	.	.	.	.	33	20	21	24	26	6.9
17JUN76	.	.	.	.	.	34	22	21	23	25	12.2
17JUN76	.	.	.	.	.	34	22	21	23	25	12.2
21JUN76	.	.	.	.	.	36	21	21	23	24	17.5
21JUN76	.	.	.	.	.	36	21	21	23	25	17.5
22JUN76	.	.	.	.	.	33	22	22	24	25	17.5
22JUN76	.	.	.	.	.	33	22	22	24	25	17.5
23JUN76	.	.	.	.	.	31	22	19	22	24	17.5
23JUN76	.	.	.	.	.	31	22	19	22	25	17.5
28JUN76	.	.	.	.	.	35	25	19	20	26	17.5
28JUN76	.	.	.	.	.	35	25	19	20	27	17.5
29JUN76	.	.	.	.	.	33	21	22	26	26	17.5
29JUN76	.	.	.	.	.	33	21	22	26	27	17.5
30JUN76	.	.	.	.	.	37	21	21	24	27	18.3
30JUN76	.	.	.	.	.	37	21	21	24	27	18.3
06JUL76	.	.	.	.	.	33	24	19	21	24	6.9

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
06JUL76	1400	47.3	100	100	78.3	1.32	5.0	4536	20.5	10.0
07JUL76	1030	59.2	100	100	72.7	1.62	4.9	4536	20.5	10.0
07JUL76	1400	65.1	100	99	70.3	1.11	4.9	4536	20.5	10.0
08JUL76	1000	56.7	100	100	78.1	1.56	5.0	4536	20.5	10.0
12JUL76	1000	32.3	.	.	.	2.83	4.9	4536	20.5	10.0
12JUL76	1400	53.4	.	.	.	1.72	5.0	4536	20.5	10.0
13JUL76	1500	42.3	.	.	.	2.50	5.3	4536	20.5	10.0
14JUL76	1000	70.0	.	.	.	1.51	5.0	4536	20.5	10.0
14JUL76	1430	71.6	.	.	.	1.79	5.0	4536	20.5	10.0
19JUL76	1000	76.4	.	.	.	1.33	5.0	4536	20.5	10.0
19JUL76	1400	28.3	.	.	.	2.22	5.2	4536	20.5	10.0
20JUL76	1000	73.9	.	.	.	1.39	4.9	4536	20.5	10.0
20JUL76	1400	25.2	.	.	.	2.93	5.0	4536	20.5	10.0
22JUL76	1000	48.4	.	.	.	2.02	4.9	4536	20.5	10.0
26JUL76	1000	43.0	.	.	.	2.11	5.0	4536	20.5	10.0
26JUL76	1400	102.0	.	.	.	1.65	5.1	4536	20.5	10.0
27JUL76	1000	47.6	.	.	.	1.29	5.1	4536	20.5	10.0
27JUL76	1400	33.0	.	.	.	2.06	5.2	4536	20.5	10.0
28JUL76	1000	125.3	.	.	.	0.81	5.1	4536	20.5	10.0
28JUL76	1400	47.8	.	.	.	2.45	5.1	4536	20.5	10.0
03AUG76	1000	26.2	.	.	.	2.81	5.1	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
06JUL76	.	.	.	.	.	33	24	19	21	24	6.9
07JUL76	.	.	.	.	.	29	20	19	21	24	7.6
07JUL76	.	.	.	.	.	29	20	19	21	24	7.6
08JUL76	.	.	.	.	.	31	18	21	25	25	7.6
12JUL76	.	.	.	.	.	37	19	17	24	27	7.6
12JUL76	.	.	.	.	.	37	19	17	24	27	7.6
13JUL76	.	.	.	.	.	.	.	.	.	26	7.6
14JUL76	.	.	.	.	.	34	20	18	23	26	7.6
14JUL76	.	.	.	.	.	34	20	18	23	26	7.6
19JUL76	.	.	.	.	.	36	22	22	23	27	10.7
19JUL76	.	.	.	.	.	36	22	22	23	28	10.7
20JUL76	.	.	.	.	.	34	22	22	26	27	10.7
20JUL76	.	.	.	.	.	34	22	22	26	27	10.7
22JUL76	.	.	.	.	.	37	23	22	27	28	10.7
26JUL76	.	.	.	.	.	37	23	22	26	28	10.7
26JUL76	.	.	.	.	.	37	23	22	26	29	10.7
27JUL76	.	.	.	.	.	31	23	24	25	27	10.7
27JUL76	.	.	.	.	.	31	23	24	25	28	10.7
28JUL76	.	.	.	.	.	36	23	23	27	29	10.7
28JUL76	.	.	.	.	.	36	23	23	27	29	10.7
03AUG76	.	.	.	.	.	37	21	16	21	23	1.0

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
03AUG76	1400	22.5	.	.	.	1.67	5.1	4536	20.5	10.0
04AUG76	1000	47.4	.	.	.	2.73	5.1	4536	20.5	10.0
04AUG76	1400	37.9	.	.	.	2.62	5.0	4536	20.5	10.0
05AUG76	1000	40.7	.	.	.	2.25	5.1	4536	20.5	10.0
05AUG76	1400	45.8	.	.	.	1.85	5.1	4536	20.5	10.0
09AUG76	1000	15.3	100	100	69.6	3.53	5.2	4536	20.5	10.0
10AUG76	1000	46.5	100	100	63.4	1.95	5.1	4536	20.5	10.0
10AUG76	1400	47.3	100	100	73.7	1.88	5.0	4536	20.5	10.0
11AUG76	1000	72.2	100	100	64.5	1.68	5.1	4536	20.5	10.0
11AUG76	1400	32.8	100	100	77.1	2.75	4.9	4536	20.5	10.0
17AUG76	1000	42.8	100	100	73.5	1.99	4.8	4536	20.5	10.0
17AUG76	1430	20.5	100	100	82.2	2.26	4.9	4536	20.5	10.0
18AUG76	1000	97.8	100	97	58.3	0.82	5.0	4536	20.5	10.0
18AUG76	1430	77.0	100	98	62.8	0.98	4.9	4536	20.5	10.0
19AUG76	1000	51.5	100	100	76.0	1.25	4.9	4536	20.5	10.0
19AUG76	1400	39.9	100	100	81.8	2.67	4.8	4536	20.5	10.0
23AUG76	1000	41.7	100	100	79.4	1.48	4.9	4536	20.5	10.0
23AUG76	1400	69.2	100	100	71.4	1.48	4.9	4536	20.5	10.0
24AUG76	1000	31.3	100	100	77.5	2.49	5.0	4536	20.5	10.0
24AUG76	1430	41.5	100	100	73.4	2.42	5.2	4536	20.5	10.0
25AUG76	930	37.6	100	100	81.6	2.94	5.0	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
03AUG76	.	.	.	.	.	37	21	16	21	25	1.0
04AUG76	.	.	.	.	.	26	17	.	.	24	1.0
04AUG76	.	.	.	.	.	26	17	.	.	25	1.0
05AUG76	.	.	.	.	.	32	17	.	.	24	1.0
05AUG76	.	.	.	.	.	32	17	.	.	25	1.0
09AUG76	.	.	.	.	.	34	19	.	.	25	4.1
10AUG76	.	.	.	.	.	31	21	.	.	25	4.1
10AUG76	.	.	.	.	.	31	21	.	.	26	4.1
11AUG76	.	.	.	.	.	33	20	.	.	25	4.1
11AUG76	.	.	.	.	.	33	20	.	.	26	4.1
17AUG76	.	.	.	.	.	35	21	20	22	26	6.3
17AUG76	.	.	.	.	.	35	21	20	22	26	6.3
18AUG76	.	.	.	.	.	31	18	18	23	25	6.3
18AUG76	.	.	.	.	.	31	18	18	23	26	6.3
19AUG76	.	.	.	.	.	27	17	17	22	24	6.3
19AUG76	.	.	.	.	.	27	17	17	22	25	6.3
23AUG76	.	.	.	.	.	28	18	24	27	24	7.1
23AUG76	.	.	.	.	.	28	18	24	27	25	7.1
24AUG76	.	.	.	.	.	33	22	23	26	25	7.1
24AUG76	.	.	.	.	.	33	22	23	26	27	7.1
25AUG76	.	.	.	.	.	33	23	22	26	26	7.1

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	FES	PH	CRE	WASH	HRS
25AUG76	1400	31.8	100	100	82.2	2.63	5.1	4536	20.5	10.0
30AUG76	1000	41.9	100	100	79.3	2.41	4.8	4536	20.5	10.0
30AUG76	1400	22.3	100	100	80.2	2.72	5.0	4536	20.5	10.0
31AUG76	930	16.5	100	99	76.8	2.90	5.0	4536	20.5	10.0
31AUG76	1430	11.2	100	100	86.7	2.62	5.1	4536	20.5	10.0
01SEP76	900	29.4	100	100	86.0	2.93	5.0	4536	20.5	10.0
01SEP76	1400	13.7	100	100	87.2	2.80	4.9	4536	20.5	10.0
07SEP76	930	40.6	100	100	66.3	2.02	6.2	4536	20.5	10.0
07SEP76	1400	73.4	100	100	59.1	2.09	5.1	4536	20.5	10.0
08SEP76	930	22.1	100	100	82.4	2.73	5.1	4536	20.5	10.0
08SEP76	1430	51.2	100	99	48.8	1.70	5.1	4536	20.5	10.0
09SEP76	1000	51.1	100	100	73.9	2.23	5.0	4536	20.5	10.0
09SEP76	1300	32.8	100	100	74.6	2.33	5.2	4536	20.5	10.0
13SEP76	1030	28.4	100	100	78.3	2.05	5.1	4536	20.5	10.0
13SEP76	1430	10.7	100	100	65.2	3.16	5.2	4536	20.5	10.0
14SEP76	1030	.	.	.	.	.	.	4536	20.5	10.0
14SEP76	1430	53.7	100	99	70.5	1.74	5.2	4536	20.5	10.0
15SEP76	1100	26.0	100	100	78.5	2.66	5.1	4536	20.5	10.0
15SEP76	1430	.	.	.	.	.	5.1	4536	20.5	10.0
20SEP76	1030	69.4	100	99	58.9	1.77	5.2	4536	20.5	10.0
20SEP76	1430	48.5	100	100	67.2	2.25	5.2	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
25AUG76	.	.	.	.	.	33	23	22	26	27	7.1
30AUG76	.	.	.	.	.	33	17	18	24	26	7.1
30AUG76	.	.	.	.	.	33	17	18	24	26	7.1
31AUG76	.	.	.	.	.	28	14	17	22	24	7.1
31AUG76	.	.	.	.	.	28	14	17	22	25	7.1
01SEP76	.	.	.	.	.	29	18	18	22	23	0.0
01SEP76	.	.	.	.	.	29	18	18	22	25	0.0
07SEP76	.	.	.	.	.	31	18	19	23	23	0.8
07SEP76	.	.	.	.	.	31	18	19	23	24	0.8
08SEP76	.	.	.	.	.	30	16	17	21	22	0.8
08SEP76	.	.	.	.	.	30	16	17	21	24	0.8
09SEP76	.	.	.	.	.	31	22	22	25	24	0.8
09SEP76	.	.	.	.	.	31	22	22	25	24	0.8
13SEP76	.	.	.	.	.	32	12	23	24	23	1.3
13SEP76	.	.	.	.	.	32	12	23	24	24	1.3
14SEP76	.	.	.	.	.	32	14	23	23	23	2.0
14SEP76	.	.	.	.	.	32	14	23	23	23	2.0
15SEP76	.	.	.	.	.	23	11	23	23	22	4.1
15SEP76	.	.	.	.	.	23	11	23	23	22	4.1
20SEP76	.	.	.	.	.	29	12	17	22	.	4.1
20SEP76	.	.	.	.	.	29	12	17	22	.	4.1

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
21SEP76	1000	38.7	100	100	73.7	2.86	5.3	4536	20.5	10.0
21SEP76	1430	41.6	100	100	77.0	2.00	5.3	4536	20.5	10.0
22SEP76	1030	64.4	100	100	51.5	1.70	5.2	4536	20.5	10.0
22SEP76	1430	14.7	100	100	76.7	3.22	5.2	4536	20.5	10.0
23SEP76	1000	.	.	.	.	.	.	4536	20.5	10.0
27SEP76	1000	25.4	100	100	67.8	2.36	5.1	4536	20.5	10.0
28SEP76	1000	68.3	100	98	66.1	3.08	5.1	4536	20.5	10.0
28SEP76	1430	72.9	100	97	51.1	1.54	5.3	4536	20.5	10.0
29SEP76	1000	77.1	100	98	48.7	1.92	5.3	4536	20.5	10.0
29SEP76	1430	29.6	100	100	73.2	3.54	5.3	4536	20.5	10.0
04OCT76	1000	25.8	100	100	71.4	3.00	5.1	4536	20.5	10.0
04OCT76	1430	76.7	100	99	55.3	1.90	5.2	4536	20.5	10.0
05OCT76	1000	37.2	100	100	73.3	2.61	5.0	4536	20.5	10.0
05OCT76	1400	61.2	100	100	57.3	2.02	4.9	4536	20.5	10.0
06OCT76	1000	44.6	100	100	69.9	2.99	4.5	4536	20.5	10.0
06OCT76	1400	41.2	100	100	76.0	2.93	4.7	4536	20.5	10.0
11OCT76	1000	38.1	100	100	68.8	2.23	4.9	4536	20.5	10.0
11OCT76	1400	55.9	100	99	64.3	2.15	4.9	4536	20.5	10.0
12OCT76	1000	51.7	100	100	66.4	2.11	4.9	4536	20.5	10.0
12OCT76	1430	43.0	100	100	83.0	2.56	5.0	4536	20.5	10.0
13OCT76	1000	94.8	100	100	65.2	1.28	5.0	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
21SEP76	.	.	.	.	.	26	19	26	27	.	4.3
21SEP76	.	.	.	.	.	28	19	26	27	.	4.3
22SEP76	.	.	.	.	.	24	14	18	23	.	4.6
22SEP76	.	.	.	.	.	24	14	18	23	.	4.6
23SEP76	.	.	.	.	.	23	21	17	22	.	4.6
27SEP76	.	.	.	.	.	22	18	22	23	.	8.6
28SEP76	.	.	.	.	.	23	22	21	22	.	8.6
28SEP76	.	.	.	.	.	23	22	21	22	.	8.6
29SEP76	.	.	.	.	.	21	17	20	22	.	8.6
29SEP76	.	.	.	.	.	21	17	20	22	.	8.6
04OCT76	.	.	.	.	.	22	17	20	22	.	0.5
04OCT76	.	.	.	.	.	22	17	20	22	.	0.5
05OCT76	.	.	.	.	.	22	15	16	20	.	0.5
05OCT76	.	.	.	.	.	22	15	16	20	.	0.5
06OCT76	.	.	.	.	.	21	20	19	21	.	0.5
06OCT76	.	.	.	.	.	21	20	19	21	.	0.5
11OCT76	.	.	.	.	.	18	12	11	17	.	3.8
11OCT76	.	.	.	.	.	18	12	11	17	.	3.8
12OCT76	.	.	.	.	.	26	7	17	18	.	3.8
12OCT76	.	.	.	.	.	26	7	17	18	.	3.8
13OCT76	.	.	.	.	.	23	14	17	17	.	3.8

MINE=HEDRIC

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
13OCT76	1430	31.1	100	100	69.7	1.98	5.0	4536	20.5	10.0
18OCT76	1000	36.0	100	100	72.2	1.99	5.0	4536	20.5	10.0
18OCT76	1430	56.9	100	98	46.3	1.45	4.9	4536	20.5	10.0
19OCT76	1000	76.6	100	99	65.0	1.52	4.9	4536	20.5	10.0
19OCT76	1400	45.0	100	99	61.2	1.82	4.9	4536	20.5	10.0
20OCT76	1000	47.4	100	100	72.6	2.87	5.0	4536	20.5	10.0
20OCT76	1430	30.0	100	100	70.3	2.24	5.1	4536	20.5	10.0
25OCT76	1000	55.1	100	99	69.4	2.08	5.0	4536	20.5	10.0
26OCT76	1000	72.3	100	99	54.2	1.57	5.0	4536	20.5	10.0
26OCT76	1430	71.8	100	99	60.1	1.83	5.0	4536	20.5	10.0
27OCT76	900	62.8	100	99	66.9	1.78	4.8	4536	20.5	10.0
27OCT76	1500	42.0	100	99	56.8	2.67	5.1	4536	20.5	10.0
01NOV76	1000	40.7	100	100	72.5	1.94	4.9	4536	20.5	10.0
01NOV76	1400	59.9	100	99	68.6	1.46	5.0	4536	20.5	10.0
02NOV76	1030	65.2	100	99	70.0	2.42	4.8	4536	20.5	10.0
03NOV76	1100	15.4	100	98	68.9	2.92	5.1	4536	20.5	10.0
08NOV76	1000	72.4	100	100	56.7	1.77	4.9	4536	20.5	10.0
08NOV76	1430	64.1	100	100	66.3	1.81	5.0	4536	20.5	10.0
09NOV76	1000	23.7	100	100	77.8	2.32	5.0	4536	20.5	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
13OCT76	.	.	.	.	.	23	14	17	17	.	3.8
18OCT76	.	.	.	.	.	24	7	7	17	.	5.1
18OCT76	.	.	.	.	.	24	7	7	17	.	5.1
19OCT76	.	.	.	.	.	13	6	.	.	.	5.1
19OCT76	.	.	.	.	.	13	6	.	.	.	5.1
20OCT76	.	.	.	.	.	16	9	.	.	.	9.7
20OCT76	.	.	.	.	.	16	9	.	.	.	9.7
25OCT76	.	.	.	.	.	21	6	.	.	.	12.2
26OCT76	.	.	.	.	.	22	14	.	.	.	12.7
26OCT76	.	.	.	.	.	22	14	.	.	.	12.7
27OCT76	.	.	.	.	.	21	6	.	.	.	12.7
27OCT76	.	.	.	.	.	21	6	.	.	.	12.7
01NOV76	.	.	.	.	.	21	1	.	.	.	0.5
01NOV76	.	.	.	.	.	21	1	.	.	.	0.5
02NOV76	.	.	.	.	.	16	4	.	.	.	0.5
03NOV76	.	.	.	.	.	13	2	.	.	.	0.5
08NOV76	.	.	.	.	.	18	0	.	.	.	0.5
08NOV76	.	.	.	.	.	18	0	.	.	.	0.5
09NOV76	.	.	.	.	.	18	-1	.	.	.	0.5

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
21JAN76	.	.	.	.	.	.	5.5	.	.	.
09FEB76	.	41.1	100	98	71.1	3.75	5.2	.	.	.
12FEB76	915	45.1	100	99	86.4	5.41	5.3	5216	.	6.4
12FEB76	1500	68.3	100	94	69.8	3.00	5.8	.	.	.
13FEB76	915	43.5	100	100	86.2	2.26	6.0	5670	.	6.7
16FEB76	1045	30.3	100	97	84.4	4.37	5.5	2631	.	3.2
16FEB76	1500	15.8	100	99	86.9	3.83	5.4	.	.	.
18FEB76	1000	31.2	100	98	90.7	6.90	5.7	4264	.	5.2
18FEB76	1400	38.2	100	99	85.6	2.59	4.7	.	.	.
19FEB76	1030	41.7	99	56	40.0	1.56	4.8	5489	.	6.7
19FEB76	1630	38.6	100	100	85.2	4.71	5.7	.	.	.
23FEB76	1000	157.3	89	2	0.1	0.77	4.9	.	.	.
23FEB76	1500	148.8	86	1	0.1	1.53	5.4	.	.	.
25FEB76	1100	29.6	100	100	89.2	3.98	5.7	5897	.	7.2
25FEB76	1600	32.4	100	99	89.8	4.75	5.6	.	.	.
27FEB76	800	42.4	100	97	80.9	3.67	5.4	.	.	.
01MAR76	800	43.4	100	98	85.0	3.58	4.9	4581	.	5.6
01MAR76	1500	48.8	100	97	81.4	3.68	5.2	.	.	.
03MAR76	930	17.8	100	97	82.6	7.44	5.3	5352	.	6.6
03MAR76	1530	39.7	100	99	88.4	4.56	5.3	.	.	.
04MAR76	1200	34.6	100	99	88.4	5.14	5.3	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
21JAN76	.	.	.	.	.	.	.	.	.	6	.
09FEB76	.	.	.	.	.	.	.	.	.	9	.
12FEB76	.	.	.	.	.	17	24	14	18	10	.
12FEB76	.	.	.	.	.	.	.	.	.	12	.
13FEB76	-12.1	44	-.193	321	140	21	3	10	14	10	.
16FEB76	-9.0	50	-.270	339	120	27	2	18	26	12	.
16FEB76	.	.	.	.	.	.	.	.	.	14	.
18FEB76	.	.	.	.	.	23	13	16	23	15	.
18FEB76	-12.8	44	-.280	342	120	.	.	.	.	15	.
19FEB76	.	.	.	.	.	23	10	12	21	14	.
19FEB76	.	.	.	.	.	.	.	.	.	15	.
23FEB76	-10.5	48	-.290	397	190	.	.	.	.	12	.
23FEB76	.	.	.	.	.	.	.	.	.	13	.
25FEB76	-15.6	36	-.163	249	140	21	1	12	20	14	.
25FEB76	.	.	.	.	.	.	.	.	.	14	.
27FEB76	-10.3	48	-.149	309	120	.	.	.	.	13	.
01MAR76	.	.	.	.	.	27	3	17	26	15	.
01MAR76	.	.	.	.	.	.	.	.	.	16	.
03MAR76	.	.	.	.	.	32	11	18	30	16	.
03MAR76	.	.	.	.	.	.	.	.	.	18	.
04MAR76	.	.	.	.	.	31	13	18	28	18	.

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
04MAR76	1545	40.9	100	99	87.0	3.77	5.4	.	.	.
08MAR76	1000	43.1	100	97	84.0	4.86	5.4	5988	.	7.3
08MAR76	1445	47.3	100	99	84.2	3.10	5.6	.	.	.
10MAR76	1030	48.7	100	93	78.5	7.44	5.2	6985	.	8.6
10MAR76	1500	48.1	100	95	80.4	5.38	5.2	.	.	.
11MAR76	1115	46.9	100	95	74.9	4.52	5.0	.	.	9.0
11MAR76	1700	25.9	100	96	85.9	4.48	5.1	.	.	.
15MAR76	1115	39.2	100	83	67.8	6.69	5.6	5262	.	6.4
15MAR76	1500	41.6	100	90	72.9	5.65	5.3	.	.	.
17MAR76	1530	41.8	100	93	77.7	5.16	5.6	3311	.	4.1
18MAR76	945	49.3	100	86	66.9	4.31	5.4	5534	.	6.8
18MAR76	1500	49.2	100	83	64.2	3.65	5.5	.	.	.
22MAR76	1115	39.3	100	97	84.1	0.40	5.5	.	.	.
22MAR76	1500	43.6	100	92	77.6	3.31	5.5	5670	.	8.5
24MAR76	945	42.5	100	94	71.2	4.81	6.0	5761	.	8.5
24MAR76	1500	35.9	100	92	74.1	4.34	5.8	5761	.	8.5
25MAR76	1430	34.2	100	96	80.6	5.31	5.6	3629	.	5.5
27MAR76	1645	31.3	100	88	71.1	5.21	5.7	.	.	.
30MAR76	1030	4.2	100	92	67.4	5.93	5.4	.	.	.
30MAR76	1615	46.9	100	65	48.9	2.63	5.9	.	.	.
31MAR76	1100	24.0	100	97	87.0	6.51	6.1	.	.	9.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
04MAR76	.	.	.	.	.	.	.	.	.	19	.
08MAR76	.	.	.	.	.	20	2	11	19	16	0.8
08MAR76	.	.	.	.	.	.	.	.	.	17	.
10MAR76	.	.	.	.	.	16	1	9	12	13	0.8
10MAR76	.	.	.	.	.	.	.	.	.	15	.
11MAR76	.	.	.	.	.	22	1	14	22	15	0.8
11MAR76	-16.3	36	-.400	281	130	.	.	.	.	15	.
15MAR76	.	.	.	.	.	18	3	14	18	13	0.8
15MAR76	-12.4	42	-.181	272	120	.	.	.	.	14	.
17MAR76	.	.	.	.	.	15	0	2	8	13	1.8
18MAR76	-10.5	70	-.206	347	190	16	-3	7	16	12	1.8
18MAR76	.	.	.	.	.	.	.	.	.	14	.
22MAR76	.	.	.	.	.	.	.	.	.	15	0.8
22MAR76	.	.	.	.	.	20	2	12	18	15	1.8
24MAR76	.	.	.	.	.	22	2	11	21	14	1.8
24MAR76	.	.	.	.	.	22	2	11	21	16	1.8
25MAR76	.	.	.	.	.	23	2	17	23	17	1.9
27MAR76	.	.	.	.	.	.	.	.	.	22	1.9
30MAR76	.	.	.	.	.	19	4	15	17	17	2.0
30MAR76	.	.	.	.	.	19	4	15	17	17	2.0
31MAR76	.	.	.	.	.	21	9	14	20	16	2.2

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
31MAR76	1600	40.1	100	90	70.9	3.62	5.6	.	.	9.0
01APR76	1445	30.9	100	91	71.9	5.38	5.6	.	.	.
06APR76	1000	24.6	100	98	86.0	5.77	5.5	.	.	.
06APR76	1515	25.7	100	99	88.1	6.26	5.7	.	.	.
07APR76	1030	17.3	100	97	84.9	6.26	6.0	.	.	.
08APR76	900	31.6	100	97	81.5	5.85	6.0	3175	.	9.0
08APR76	1400	31.3	100	98	86.1	7.51	5.9	3175	.	9.0
12APR76	1100	24.7	100	96	80.5	6.09	5.4	4899	.	8.0
12APR76	1400	23.4	100	92	75.2	4.69	5.2	4899	.	8.0
15APR76	900	32.9	100	96	82.3	4.87	5.0	2722	.	9.0
15APR76	1415	34.3	100	97	83.2	5.87	4.9	2722	.	9.0
20APR76	1000	37.2	100	98	84.2	3.84	4.9	4137	.	.
20APR76	1345	21.2	100	74	46.2	3.24	5.6	4137	.	.
21APR76	1000	35.7	100	98	83.3	4.98	5.3	5316	.	9.0
21APR76	1430	34.4	100	98	85.4	4.52	5.2	5316	.	9.0
26APR76	1125	17.2	100	92	68.7	4.97	5.4	.	.	.
28APR76	1000	21.3	100	100	91.5	6.23	5.0	5897	.	9.0
28APR76	1630	22.1	100	100	89.0	.	.	5897	.	9.0
29APR76	900	29.2	100	99	87.7	4.10	4.9	4581	.	9.0
29APR76	1610	35.7	100	97	84.1	5.40	5.2	4581	.	9.0
03MAY76	900	30.6	100	94	82.0	4.26	5.2	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
31MAR76	.	.	.	.	.	21	9	14	20	18	2.2
01APR76	.	.	.	.	.	21	4	12	21	17	0.1
06APR76	.	.	.	.	.	26	1	14	24	17	0.1
06APR76	.	.	.	.	.	26	1	14	24	19	0.1
07APR76	.	.	.	.	.	.	.	.	.	18	0.1
08APR76	.	.	.	.	.	24	7	17	24	14	0.1
08APR76	.	.	.	.	.	24	7	17	24	16	0.1
12APR76	.	.	.	.	.	27	-2	9	16	15	0.1
12APR76	.	.	.	.	.	27	-2	9	16	17	0.1
15APR76	.	.	.	.	.	32	12	17	27	17	0.1
15APR76	.	.	.	.	.	32	12	17	27	19	0.1
20APR76	.	.	.	.	.	33	11	20	32	21	0.1
20APR76	.	.	.	.	.	33	11	20	32	22	0.1
21APR76	.	.	.	.	.	31	14	19	30	22	0.1
21APR76	.	.	.	.	.	31	14	19	30	24	0.1
26APR76	.	.	.	.	.	.	.	.	.	21	.
28APR76	.	.	.	.	.	24	3	12	23	17	0.1
28APR76	.	.	.	.	.	24	3	14	23	20	0.1
29APR76	.	.	.	.	.	22	6	11	21	19	0.1
29APR76	.	.	.	.	.	22	6	11	21	21	0.1
03MAY76	.	.	.	.	.	.	.	.	.	20	.

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
04MAY76	1700	24.4	100	86	78.2	3.18	5.0	4173	.	7.5
06MAY76	900	49.9	100	89	67.9	4.08	5.0	.	.	8.5
06MAY76	1630	41.8	100	97	79.8	3.85	5.0	.	.	8.5
14MAY76	1025	34.9	100	84	85.8	7.60	5.4	2722	.	6.0
14MAY76	1440	30.5	99	70	55.9	2.91	4.7	2722	.	6.0
17MAY76	900	261.8	93	30	22.8	3.60	6.0	4082	.	8.0
17MAY76	1630	274.9	98	40	33.2	2.80	5.2	4082	.	8.0
20MAY76	.	93.8	99	50	40.1	2.04	5.5	5534	.	9.2
20MAY76	1630	101.2	96	41	30.8	1.50	5.4	5534	.	9.2
21MAY76	800	94.0	94	38	28.8	2.59	5.3	2631	.	4.5
21MAY76	1200	124.4	91	35	27.7	1.46	5.1	2631	.	4.5
24MAY76	900	145.6	99	58	48.0	0.88	5.4	5670	.	8.5
24MAY76	1600	111.4	99	47	33.3	1.74	5.5	5670	.	8.5
31MAY76	1000	96.5	95	42	31.9	0.59	5.2	2631	.	8.0
31MAY76	1300	56.6	96	50	37.6	1.06	5.2	2631	.	8.0
08JUN76	.	123.7	98	54	44.7	0.91	6.4	4717	.	9.5
08JUN76	1500	145.6	97	56	44.7	0.83	5.4	4717	.	9.5
14JUN76	1000	83.8	97	68	58.3	1.83	5.6	3810	.	8.0
14JUN76	1650	67.9	95	58	46.0	1.86	5.6	3810	.	8.0
21JUN76	1000	63.3	98	38	26.7	1.80	5.8	5443	.	9.5
21JUN76	1400	69.7	97	40	27.3	1.63	5.8	5443	.	9.5

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
04MAY76	.	.	.	.	.	29	4	17	27	22	3.8
06MAY76	.	.	.	.	.	29	6	19	28	.	3.8
06MAY76	.	.	.	.	.	29	6	19	28	22	3.8
14MAY76	.	.	.	.	.	37	6	21	27	22	3.8
14MAY76	.	.	.	.	.	37	6	21	27	24	3.8
17MAY76	.	.	.	.	.	31	18	26	29	22	8.4
17MAY76	.	.	.	.	.	31	18	26	29	25	8.4
20MAY76	.	.	.	.	.	30	7	17	31	20	8.4
20MAY76	.	.	.	.	.	30	7	17	31	23	8.4
21MAY76	.	.	.	.	.	27	6	18	27	21	8.4
21MAY76	.	.	.	.	.	27	6	18	27	22	8.4
24MAY76	.	.	.	.	.	**	7	17	23	21	8.9
24MAY76	.	.	.	.	.	**	7	17	23	23	8.9
31MAY76	.	.	.	.	.	31	12	23	31	24	11.9
31MAY76	.	.	.	.	.	31	12	23	31	24	11.9
08JUN76	.	.	.	.	.	37	14	21	33	.	6.3
08JUN76	.	.	.	.	.	37	14	21	33	24	6.3
14JUN76	.	.	.	.	.	**	14	23	28	23	6.6
14JUN76	.	.	.	.	.	**	14	23	28	24	6.6
21JUN76	.	.	.	.	.	29	16	21	23	22	10.2
21JUN76	.	.	.	.	.	29	16	21	23	24	10.2

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
25JUN76	845	31.7	100	81	70.5	2.73	6.4	4536	.	9.5
25JUN76	1145	31.2	100	87	76.6	2.58	6.5	4536	.	9.5
28JUN76	830	57.8	98	79	68.6	1.79	5.3	4944	.	9.5
28JUN76	1430	57.8	99	61	49.5	2.41	5.7	4944	.	9.5
29JUN76	900	67.5	99	76	64.3	1.89	5.8	4128	.	8.5
29JUN76	1500	11.0	99	44	16.6	3.93	6.1	4128	.	8.5
01JUL76	900	86.3	99	65	55.8	1.08	5.1	4536	.	9.5
01JUL76	1500	76.7	99	47	34.6	1.63	5.4	4536	.	9.5
06JUL76	1145	64.5	99	32	19.1	1.02	6.0	4672	.	9.5
06JUL76	1530	99.3	99	59	47.9	1.50	5.2	4672	.	9.5
12JUL76	1100	65.7	99	48	35.5	1.34	5.8	.	.	8.5
12JUL76	1500	53.1	100	71	52.5	1.70	5.3	4808	.	8.5
14JUL76	1000	55.4	99	77	61.2	2.11	5.2	4990	.	9.5
14JUL76	1515	33.7	100	99	82.7	2.94	5.2	4990	.	9.5
16JUL76	1015	89.1	99	62	48.8	1.27	5.4	.	.	3.0
16JUL76	1400	88.5	99	52	37.6	1.05	5.3	.	.	3.0
22JUL76	1100	122.7	99	32	18.2	0.95	6.2	4581	.	8.5
22JUL76	1415	144.9	99	36	20.7	0.49	6.3	4581	.	8.5
23JUL76	1000	110.1	99	65	54.4	1.50	5.8	4990	.	8.5
23JUL76	1515	69.7	96	58	47.6	2.00	5.8	4990	.	8.5
27JUL76	1045	117.6	99	51	37.7	1.24	5.7	4990	.	9.5

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
25JUN76	.	.	.	.	.	28	18	23	29	27	10.2
25JUN76	.	.	.	.	.	28	18	23	29	27	10.2
28JUN76	.	.	.	.	.	36	18	24	28	27	12.2
28JUN76	.	.	.	.	.	36	18	24	28	28	12.2
29JUN76	.	.	.	.	.	37	20	26	37	25	12.2
29JUN76	.	.	.	.	.	37	20	26	37	28	12.2
01JUL76	.	.	.	.	.	37	18	23	32	27	0.0
01JUL76	.	.	.	.	.	37	18	23	32	28	0.0
06JUL76	.	.	.	.	.	37	16	23	30	23	0.8
06JUL76	.	.	.	.	.	37	16	23	30	24	0.8
12JUL76	.	.	.	.	.	34	20	.	.	.	0.8
12JUL76	.	.	.	.	.	34	20	.	.	23	0.8
14JUL76	.	.	.	.	.	35	17	20	28	25	0.8
14JUL76	.	.	.	.	.	35	17	20	28	27	0.8
16JUL76	.	.	.	.	.	34	23	22	30	26	0.8
16JUL76	.	.	.	.	.	34	23	22	30	28	0.8
22JUL76	.	.	.	.	.	37	22	.	.	28	0.8
22JUL76	.	.	.	.	.	37	22	.	.	30	0.8
23JUL76	.	.	.	.	.	37	21	22	32	28	0.8
23JUL76	.	.	.	.	.	37	21	22	32	28	0.8
27JUL76	.	.	.	.	.	37	24	27	37	27	0.8

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
27JUL76	1630	123.0	99	45	29.4	1.17	5.7	4990	.	9.5
09AUG76	1000	155.3	99	58	50.2	0.89	5.4	5352	.	9.0
09AUG76	1400	86.1	.	.	.	1.61	5.5	5352	.	9.0
12AUG76	1045	96.7	99	48	36.3	2.01	5.7	4990	.	8.5
12AUG76	1415	87.7	97	61	68.1	0.73	5.3	4990	.	8.5
16AUG76	1000	98.5	.	.	.	1.60	5.3	.	.	.
16AUG76	1500	96.7	98	57	47.6	1.51	5.3	.	.	.
17AUG76	1000	47.2	100	98	84.5	6.66	5.9	.	.	.
17AUG76	1500	39.2	100	99	86.2	4.57	5.6	.	.	.
26AUG76	1000	39.7	100	99	86.0	5.26	6.6	.	.	.
26AUG76	1500	41.0	100	99	88.4	4.79	5.8	.	.	.
09SEP76	1000	53.5	100	86	74.9	2.58	5.7	.	.	.
09SEP76	1530	43.9	99	84	73.8	2.93	5.9	.	.	.
22SEP76	1000	64.5	98	60	42.9	2.20	5.8	.	.	.
22SEP76	1500	62.1	100	85	68.6	3.21	5.4	.	.	.
27SEP76	1000	34.5	100	73	60.5	2.10	5.4	.	.	.
27SEP76	1530	26.4	98	55	35.7	3.00	6.0	.	.	.
29SEP76	1000	34.0	100	73	55.2	0.64	6.1	.	.	.
29SEP76	1510	68.5	99	75	57.8	2.19	5.8	.	.	.
040CT76	1000	65.7	99	82	71.2	1.70	6.0	.	.	.
040CT76	1500	38.2	97	54	39.6	2.57	5.8	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
27JUL76	.	.	.	.	.	37	24	27	37	29	0.8
09AUG76	.	.	.	.	.	28	16	.	.	26	0.0
09AUG76	.	.	.	.	.	28	16	.	.	27	0.0
12AUG76	.	.	.	.	.	32	18	24	28	24	.
12AUG76	.	.	.	.	.	32	18	24	28	27	.
16AUG76	.	.	.	.	.	.	.	.	.	25	.
16AUG76	.	.	.	.	.	.	.	.	.	26	.
17AUG76	.	.	.	.	.	37	30	21	29	.	.
17AUG76	.	.	.	.	.	.	.	.	.	.	.
26AUG76	.	.	.	.	.	32	22	21	32	27	.
26AUG76	.	.	.	.	.	37	29	20	28	.	.
09SEP76	.	.	.	.	.	.	.	.	.	.	.
09SEP76	.	.	.	.	.	.	.	.	.	.	.
22SEP76	.	.	.	.	.	.	.	.	.	23	.
22SEP76	.	.	.	.	.	.	.	.	.	24	.
27SEP76	.	.	.	.	.	.	.	.	.	20	.
27SEP76	.	.	.	.	.	.	.	.	.	24	.
29SEP76	.	.	.	.	.	.	.	.	.	23	.
29SEP76	.	.	.	.	.	.	.	.	.	24	.
040CT76	.	.	.	.	.	.	.	.	.	21	.
040CT76	.	.	.	.	.	.	.	.	.	22	.

MINE=SENTER

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
05OCT76	1000	64.6	97	64	54.7	2.69	5.9	.	.	.
05OCT76	1500	59.3	98	59	43.6	2.88	5.8	.	.	.
06OCT76	.	129.6	97	55	40.5	2.47	5.8	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
05OCT76	.	.	.	.	.	.	.	.	.	.	.
05OCT76	.	.	.	.	.	.	.	.	.	.	.
06OCT76	.	.	.	.	.	.	.	.	.	23	.

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
09FEB76	.	7.5	100	100	71.7	0.40	3.5	.	.	.
10FEB76	1000	24.4	100	100	84.7	4.61	5.8	.	.	.
10FEB76	1430	12.3	100	100	79.5	3.96	5.5	.	.	.
13FEB76	930	17.7	100	100	79.3	3.84	5.3	1769	.	7.5
13FEB76	1410	33.4	100	100	83.2	3.27	5.2	.	.	.
16FEB76	1000	26.0	100	100	73.8	1.53	5.5	1833	.	8.0
16FEB76	1430	22.2	100	100	75.5	1.54	5.5	.	.	.
17FEB76	1000	9.6	100	100	74.9	2.09	5.6	1397	.	7.0
17FEB76	1430	34.2	100	100	66.4	1.44	5.4	.	.	.
18FEB76	1000	14.7	100	100	82.8	4.01	5.4	1724	.	7.0
18FEB76	1430	19.5	100	100	83.1	4.28	5.3	.	.	.
19FEB76	1000	22.0	100	100	90.3	4.68	5.2	1814	.	8.0
19FEB76	1430	23.4	100	100	88.3	3.03	5.4	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
09FEB76	-19.4	30	-.205	233	140	.	.	.	.	8	0.0
10FEB76	-19.1	34	-.128	186	120	9	-3	4	8	8	0.0
10FEB76	-50.6	16	-.017	74	140	.	.	.	.	9	.
13FEB76	-34.4	22	-.083	129	120	16	3	9	14	9	0.0
13FEB76	-14.1	44	-.148	242	130	.	.	.	.	10	.
16FEB76	-20.8	34	-.127	196	140	22	6	16	19	11	0.0
16FEB76	-30.3	19	-.084	158	160	.	.	.	.	14	.
17FEB76	-69.7	11	-.017	57	40	25	16	16	20	13	0.0
17FEB76	-16.3	30	-.160	235	140	.	.	.	.	15	.
18FEB76	-51.7	14	-.025	87	140	25	14	14	20	15	0.0
18FEB76	-25.3	24	-.082	162	150	.	.	.	.	16	.
19FEB76	-19.3	32	-.166	225	150	25	9	11	17	15	0.0
19FEB76	-30.4	20	-.109	175	120	.	.	.	.	16	.

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	CRE	WASH	HRS
20FEB76	1000	30.6	100	100	67.7	1.29	5.4	1733	.	8.0
20FEB76	1430	34.6	100	100	54.7	0.79	5.5	.	.	.
23FEB76	1030	24.6	100	100	83.4	5.49	5.1	1787	.	8.0
23FEB76	1400	22.5	100	100	79.8	3.77	5.1	.	.	.
24FEB76	1000	13.8	100	100	87.2	1.03	5.5	.	.	.
24FEB76	1430	29.1	100	100	24.9	0.70	5.3	.	.	.
25FEB76	1000	17.1	100	100	85.9	1.47	6.0	1833	.	8.0
25FEB76	1430	16.3	100	100	85.3	1.78	6.2	.	.	.
26FEB76	1000	29.4	100	100	49.2	0.72	5.5	.	.	.
26FEB76	1430	13.8	100	100	79.8	1.75	5.6	.	.	.
27FEB76	1000	15.4	100	100	90.9	2.92	5.9	1896	.	8.0
27FEB76	1445	20.2	100	100	93.6	1.76	5.6	.	.	.
02MAR76	1000	13.8	100	100	83.6	7.13	6.5	.	.	.
03MAR76	1000	12.8	100	100	84.4	4.65	6.4	1588	.	8.0
03MAR76	1430	21.2	100	100	91.9	3.78	6.3	.	.	.
04MAR76	1000	16.0	100	100	88.8	5.38	6.0	1923	.	8.0
04MAR76	1430	13.6	100	100	91.2	4.75	5.8	.	.	.
05MAR76	1000	17.6	100	100	89.2	3.75	6.1	1669	.	8.0
05MAR76	1430	28.5	100	100	82.5	3.26	5.9	.	.	.
08MAR76	1000	15.2	100	100	84.9	3.57	5.2	1778	.	8.0
08MAR76	1430	9.1	100	100	89.0	4.38	5.4	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
20FEB76	-37.0	21	-.078	149	140	21	14	6	14	14	0.0
20FEB76	-58.2	13	-.037	114	100	.	.	.	.	15	.
23FEB76	-12.9	46	-.166	275	140	25	1	3	7	12	0.8
23FEB76	-20.2	27	-.122	207	140	.	.	.	.	13	.
24FEB76	.	.	.	.	.	11	-3	5	9	12	0.8
24FEB76	.	.	.	.	.	11	-3	5	9	13	0.8
25FEB76	-46.2	20	-.079	123	100	18	0	8	13	12	0.8
25FEB76	-41.3	18	-.089	121	100	.	.	.	.	13	.
26FEB76	.	.	.	.	.	26	3	12	16	12	0.8
26FEB76	.	.	.	.	.	26	3	12	16	13	0.8
27FEB76	-28.7	25	-.158	165	100	22	3	11	17	13	0.8
27FEB76	-42.0	18	-.105	137	100	.	.	.	.	14	.
02MAR76	.	.	.	.	.	27	16	17	20	16	0.0
03MAR76	-56.9	14	-.074	87	100	27	11	16	21	16	0.0
03MAR76	-35.7	21	-.143	169	140	.	.	.	.	17	.
04MAR76	-39.0	18	-.116	140	90	29	12	18	21	17	0.0
04MAR76	-33.3	20	-.148	161	100	.	.	.	.	18	.
05MAR76	-29.2	19	-.175	197	140	29	17	18	21	18	0.0
05MAR76	-20.1	36	-.212	242	140	.	.	.	.	19	.
08MAR76	-31.4	22	-.158	184	140	26	2	8	14	15	1.0
08MAR76	-79.0	11	-.047	70	70	.	.	.	.	16	.

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
09MAR76	1000	15.6	100	99	88.1	2.29	5.3	1724	.	8.0
09MAR76	1430	28.1	100	100	82.7	5.00	5.7	.	.	.
10MAR76	1000	16.0	100	100	87.6	6.51	6.7	1669	.	8.0
10MAR76	1430	20.1	100	100	84.6	3.99	6.6	.	.	.
12MAR76	1000	15.3	100	99	86.4	5.21	5.7	1751	.	8.0
12MAR76	1430	22.9	100	100	80.1	3.74	5.3	.	.	.
15MAR76	1000	24.3	100	100	77.2	3.08	6.1	1615	.	8.0
15MAR76	1400	29.2	100	100	77.2	4.50	5.8	.	.	.
17MAR76	950	62.6	100	100	59.9	1.19	5.4	1751	.	8.0
17MAR76	1500	15.3	100	100	86.7	5.19	5.4	.	.	.
19MAR76	1000	6.6	100	100	87.7	1.08	5.4	1107	.	3.5
19MAR76	1200	15.0	100	100	90.3	5.98	5.3	.	.	.
22MAR76	1000	28.0	100	100	80.4	1.50	5.5	1833	.	8.0
22MAR76	1500	21.7	100	99	87.7	3.62	5.3	1833	.	8.0
24MAR76	1000	6.7	100	100	90.9	3.18	5.7	.	.	.
24MAR76	1500	25.0	100	100	81.5	4.35	5.7	.	.	.
25MAR76	1000	26.5	100	100	79.6	1.96	5.9	.	.	.
25MAR76	1430	33.9	100	100	75.8	3.51	5.5	.	.	.
29MAR76	1000	19.0	100	100	90.5	2.77	5.5	.	.	.
29MAR76	1400	28.5	100	100	74.6	2.08	5.7	.	.	.
31MAR76	1000	18.2	100	99	81.3	2.90	5.8	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
09MAR76	-45.0	18	-.055	122	100	19	6	9	9	15	1.8
09MAR76	-12.5	50	-.220	309	140	.	.	.	.	15	.
10MAR76	-25.0	20	-.138	195	130	19	2	3	6	13	1.8
10MAR76	-41.7	18	-.083	133	100	.	.	.	.	14	.
12MAR76	-27.3	23	-.135	179	130	20	7	9	13	13	1.8
12MAR76	-27.5	24	-.110	174	100	.	.	.	.	14	.
15MAR76	-16.7	35	-.188	261	100	18	3	6	8	13	1.8
15MAR76	-16.7	35	-.160	240	100	.	.	.	.	14	.
17MAR76	-23.3	27	-.116	216	130	17	0	3	7	10	5.3
17MAR76	-22.5	20	-.055	252	120	.	.	.	.	11	.
19MAR76	-65.8	13	-.021	66	100	19	-2	10	16	12	5.3
19MAR76	-29.5	24	-.116	156	110	.	.	.	.	13	.
22MAR76	-48.3	16	-.063	115	100	26	4	7	13	14	5.3
22MAR76	.	.	.	.	.	26	4	7	13	15	5.3
24MAR76	.	.	.	.	.	21	0	9	16	14	5.3
24MAR76	.	.	.	.	.	21	0	9	16	15	5.3
25MAR76	.	.	.	.	.	22	8	10	11	15	5.3
25MAR76	.	.	.	.	.	22	8	10	11	16	5.3
29MAR76	.	.	.	.	.	26	3	12	21	16	5.3
29MAR76	.	.	.	.	.	26	3	12	21	17	5.3
31MAR76	.	.	.	.	.	23	11	14	16	17	5.3

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
31MAR76	1330	11.1	100	100	73.5	5.67	5.6	.	.	.
05APR76	1030	14.0	100	99	81.1	2.68	5.8	1443	.	8.0
05APR76	1430	15.1	100	100	84.5	2.52	6.1	1443	.	8.0
07APR76	1000	25.1	100	100	66.4	1.21	6.4	1148	.	8.0
07APR76	1330	21.6	100	99	41.3	0.65	6.2	1148	.	8.0
08APR76	1000	34.7	100	100	79.0	3.17	6.4	1502	.	8.0
08APR76	1400	25.0	100	100	73.9	2.38	6.6	1502	.	8.0
12APR76	945	22.6	100	100	81.4	4.43	6.5	1461	.	8.0
12APR76	1400	18.1	100	99	78.4	3.08	6.5	1461	.	8.0
20APR76	945	14.6	100	100	82.2	6.51	6.6	1961	.	10.0
20APR76	1400	25.9	100	100	65.7	2.30	6.6	1961	.	10.0
21APR76	1000	9.3	100	100	67.1	1.75	6.7	2288	.	10.0
21APR76	1500	23.5	100	100	52.4	1.27	6.4	2288	.	10.0
22APR76	1000	21.9	100	100	58.2	1.40	6.6	1849	.	10.0
22APR76	1430	28.7	100	100	64.8	3.90	6.7	1849	.	10.0
26APR76	1000	20.8	100	100	74.6	5.24	6.7	1878	.	10.0
26APR76	1500	22.5	100	100	75.5	2.71	6.8	1878	.	10.0
27APR76	1000	21.3	100	.	.	4.54	6.7	1635	.	10.0
27APR76	1500	24.7	100	.	.	3.28	6.7	1635	.	10.0
28APR76	1000	16.7	100	.	.	2.64	7.0	2316	.	10.0
28APR76	1430	24.4	100	100	68.3	2.16	6.6	2316	.	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
31MAR76	.	.	.	.	.	23	11	14	16	18	5.3
05APR76	.	.	.	.	.	29	3	7	16	17	1.0
05APR76	.	.	.	.	.	29	3	7	16	18	1.0
07APR76	.	.	.	.	.	27	2	12	22	17	1.0
07APR76	.	.	.	.	.	27	2	12	22	19	1.0
08APR76	.	.	.	.	.	23	7	12	19	18	1.0
08APR76	.	.	.	.	.	23	7	12	19	19	1.0
12APR76	.	.	.	.	.	26	-2	3	10	15	1.0
12APR76	.	.	.	.	.	26	-2	3	10	17	1.0
20APR76	.	.	.	.	.	34	12	17	18	21	1.0
20APR76	.	.	.	.	.	34	12	17	18	23	1.0
21APR76	.	.	.	.	.	31	13	16	22	23	1.0
21APR76	.	.	.	.	.	31	13	16	22	24	1.0
22APR76	.	.	.	.	.	32	13	21	28	23	1.0
22APR76	.	.	.	.	.	32	13	21	28	24	1.0
26APR76	.	.	.	.	.	34	12	11	17	21	1.0
26APR76	.	.	.	.	.	34	12	11	17	22	1.0
27APR76	.	.	.	.	.	23	3	6	12	19	1.0
27APR76	.	.	.	.	.	23	3	6	12	20	1.0
28APR76	.	.	.	.	.	21	3	8	14	18	1.0
28APR76	.	.	.	.	.	21	3	8	14	19	1.0

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
03MAY76	1000	12.0	100	100	76.5	3.12	6.5	2128	.	10.0
03MAY76	1445	15.3	100	100	88.6	8.32	6.0	2128	.	10.0
04MAY76	1000	27.8	100	100	64.1	.	.	1210	.	6.0
04MAY76	1530	36.6	100	100	67.6	2.52	6.0	1210	.	6.0
05MAY76	945	122.2	100	100	99.5	.	.	1774	.	8.0
05MAY76	1500	12.7	100	100	87.0	2.67	5.9	1774	.	8.0
06MAY76	945	8.0	100	100	84.7	3.29	5.9	2587	.	10.5
06MAY76	1445	31.4	100	100	85.6	.	5.6	2587	.	10.5
10MAY76	1000	22.7	100	100	74.5	2.72	6.2	2003	.	10.0
10MAY76	1430	28.6	100	100	93.0	.	5.6	2003	.	10.0
12MAY76	1000	21.8	100	100	84.3	3.04	6.4	2149	.	10.0
12MAY76	1445	21.8	100	100	83.0	3.52	7.0	2149	.	10.0
13MAY76	1000	25.6	100	100	87.8	5.42	6.3	2087	.	10.0
13MAY76	1500	25.4	100	100	79.4	3.25	5.8	2087	.	10.0
17MAY76	945	26.6	100	100	77.8	1.99	6.0	2003	.	10.0
17MAY76	1500	26.5	100	100	68.5	2.46	6.5	2003	.	10.0
18MAY76	945	33.7	100	100	60.7	2.58	5.7	2066	.	10.0
18MAY76	1445	21.9	100	100	88.0	1.43	5.6	2066	.	10.0
19MAY76	1000	19.8	100	100	73.3	1.57	5.2	2309	.	10.0
19MAY76	1500	24.9	100	100	75.6	7.92	5.4	2309	.	10.0
25MAY76	1000	27.9	100	100	76.0	2.87	5.6	2170	.	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
03MAY76	.	.	.	.	.	28	12	14	18	19	8.9
03MAY76	.	.	.	.	.	28	12	14	18	21	8.9
04MAY76	.	.	.	.	.	28	8	10	17	19	8.9
04MAY76	.	.	.	.	.	28	8	10	17	20	8.9
05MAY76	.	.	.	.	.	28	9	12	17	19	8.9
05MAY76	.	.	.	.	.	28	9	12	17	20	8.9
06MAY76	.	.	.	.	.	27	9	16	19	20	8.9
06MAY76	.	.	.	.	.	27	9	16	19	21	8.9
10MAY76	.	.	.	.	.	26	4	14	18	19	11.7
10MAY76	.	.	.	.	.	26	4	14	18	20	11.7
12MAY76	.	.	.	.	.	29	12	18	22	20	11.7
12MAY76	.	.	.	.	.	29	12	18	22	22	11.7
13MAY76	.	.	.	.	.	29	17	17	18	21	11.7
13MAY76	.	.	.	.	.	29	17	17	18	23	11.7
17MAY76	.	.	.	.	.	32	17	18	21	23	15.5
17MAY76	.	.	.	.	.	32	17	18	21	24	15.5
18MAY76	.	.	.	.	.	29	19	18	21	23	15.5
18MAY76	.	.	.	.	.	29	19	18	21	24	15.5
19MAY76	.	.	.	.	.	29	6	9	14	20	15.5
19MAY76	.	.	.	.	.	29	6	9	14	21	15.5
25MAY76	.	.	.	.	.	22	16	11	16	20	15.5

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
25MAY76	1445	10.9	100	100	82.8	4.77	5.7	2170	.	10.0
26MAY76	1000	21.2	100	100	76.9	3.56	5.3	2212	.	10.0
26MAY76	1430	30.3	100	100	79.0	1.67	5.2	2212	.	10.0
27MAY76	945	31.7	100	100	79.9	2.12	4.9	2400	.	10.0
27MAY76	1430	33.7	100	100	61.6	1.56	5.1	2400	.	10.0
31MAY76	930	29.3	100	100	67.7	3.66	6.4	1628	.	7.5
31MAY76	1415	17.4	100	100	81.2	2.75	5.6	1628	.	7.5
01JUN76	1000	16.9	100	100	84.1	5.18	5.6	2212	.	10.0
01JUN76	1445	32.0	100	100	71.5	3.32	5.5	2212	.	10.0
02JUN76	930	20.1	100	100	64.2	3.71	6.3	947	.	4.5
03JUN76	945	23.0	100	100	85.1	2.01	5.8	2671	.	10.0
03JUN76	1430	14.2	100	100	86.1	6.68	5.7	2671	.	10.0
07JUN76	1000	11.4	100	100	83.5	3.91	5.7	.	.	.
07JUN76	1500	21.5	100	100	89.2	4.05	5.5	.	.	.
08JUN76	1000	17.2	100	100	83.3	1.02	5.7	2087	.	10.0
08JUN76	1500	20.1	100	100	76.1	1.30	5.5	2087	.	.
09JUN76	1015	21.0	100	100	77.0	2.86	6.1	2087	.	.
09JUN76	1500	11.8	100	100	.	2.41	6.1	2087	.	.
15JUN76	1000	41.8	100	100	82.9	6.54	5.6	2233	.	.
15JUN76	1445	20.1	100	100	87.0	4.80	5.6	2233	.	.
16JUN76	1000	4.2	100	100	90.2	3.17	5.9	2212	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
25MAY76	.	.	.	.	.	22	16	11	16	21	15.5
26MAY76	.	.	.	.	.	23	12	13	16	20	15.5
26MAY76	.	.	.	.	.	23	12	13	16	22	15.5
27MAY76	.	.	.	.	.	21	11	15	20	21	15.5
27MAY76	.	.	.	.	.	21	11	15	20	22	15.5
31MAY76	.	.	.	.	.	31	12	19	22	23	17.8
31MAY76	.	.	.	.	.	31	12	19	22	24	17.8
01JUN76	.	.	.	.	.	32	19	21	25	24	0.0
01JUN76	.	.	.	.	.	32	19	21	25	26	0.0
02JUN76	.	.	.	.	.	33	18	21	24	25	1.3
03JUN76	.	.	.	.	.	32	17	17	18	24	1.3
03JUN76	.	.	.	.	.	32	17	17	18	24	1.3
07JUN76	.	.	.	.	.	24	8	13	16	20	4.3
07JUN76	.	.	.	.	.	24	8	13	16	22	4.3
08JUN76	.	.	.	.	.	29	14	17	23	22	4.3
08JUN76	.	.	.	.	.	29	14	17	23	23	4.3
09JUN76	.	.	.	.	.	34	14	20	26	24	4.3
09JUN76	.	.	.	.	.	34	14	20	26	24	4.3
15JUN76	.	.	.	.	.	31	19	20	21	25	7.6
15JUN76	.	.	.	.	.	31	19	20	21	27	7.6
16JUN76	.	.	.	.	.	33	18	22	24	26	7.6

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
16JUN76	1430	20.2	100	100	89.4	3.07	5.6	2212	.	10.0
17JUN76	1000	21.0	100	100	80.1	1.64	5.9	.	.	.
17JUN76	1500	18.8	100	100	82.8	1.65	5.8	.	.	.
21JUN76	1000	18.1	100	100	70.9	1.32	6.0	2358	.	.
21JUN76	1430	20.3	100	100	79.4	1.67	6.0	2358	.	.
22JUN76	1000	17.4	100	100	78.8	1.12	5.9	2400	.	10.0
22JUN76	1245	15.8	100	100	80.4	1.68	6.3	2400	.	10.0
23JUN76	945	13.7	100	100	89.2	1.66	6.6	2358	.	.
23JUN76	1245	17.0	100	100	86.1	3.03	6.4	2358	.	.
24JUN76	1000	18.6	100	100	79.0	2.80	6.4	1982	.	10.0
28JUN76	1000	17.2	100	100	92.2	3.26	6.5	1732	.	.
28JUN76	1445	18.4	100	100	90.3	4.06	6.0	1732	.	.
29JUN76	1000	16.1	100	100	87.5	.	6.6	1941	.	10.0
29JUN76	1445	18.5	100	100	79.5	.	6.3	1941	.	10.0
30JUN76	1000	23.8	100	100	69.8	1.28	5.9	2149	.	10.0
30JUN76	1445	20.7	100	100	80.2	1.66	6.2	2149	.	10.0
06JUL76	1000	11.7	100	100	85.7	2.05	6.4	2087	.	10.0
06JUL76	1430	20.2	100	100	88.4	1.52	6.3	2087	.	10.0
07JUL76	945	13.6	100	100	88.1	2.27	6.3	2233	.	10.0
07JUL76	.	32.1	100	100	82.5	1.39	5.8	2233	.	10.0
19JUL76	1000	17.5	100	100	91.1	5.36	5.5	1502	.	10.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
16JUN76	.	.	.	.	.	33	18	22	24	27	7.6
17JUN76	.	.	.	.	.	31	20	22	22	27	7.6
17JUN76	.	.	.	.	.	31	20	22	22	26	7.6
21JUN76	.	.	.	.	.	36	21	21	24	25	11.2
21JUN76	.	.	.	.	.	36	21	21	24	26	11.2
22JUN76	.	.	.	.	.	31	21	22	25	25	11.9
22JUN76	.	.	.	.	.	31	21	22	25	26	11.9
23JUN76	.	.	.	.	.	31	18	18	19	25	11.9
23JUN76	.	.	.	.	.	31	18	18	19	26	11.9
24JUN76	.	.	.	.	.	34	18	18	21	25	11.9
28JUN76	.	.	.	.	.	32	20	21	24	26	16.3
28JUN76	.	.	.	.	.	32	20	21	24	27	16.3
29JUN76	.	.	.	.	.	31	20	21	22	26	16.3
29JUN76	.	.	.	.	.	31	20	21	22	27	16.3
30JUN76	.	.	.	.	.	33	22	21	26	27	16.3
30JUN76	.	.	.	.	.	33	22	21	26	28	16.3
06JUL76	.	.	.	.	.	31	16	21	23	26	0.3
06JUL76	.	.	.	.	.	31	16	21	23	26	0.3
07JUL76	.	.	.	.	.	28	19	20	22	25	2.8
07JUL76	.	.	.	.	.	28	19	20	22	26	2.8
19JUL76	.	.	.	.	.	34	21	21	24	27	6.1

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
19JUL76	1500	13.6	100	100	85.8	0.82	5.7	1502	.	10.0
20JUL76	930	8.6	100	100	72.3	5.83	6.3	1753	.	10.0
20JUL76	1500	25.2	100	100	68.3	1.41	6.4	1753	.	10.0
21JUL76	945	7.7	100	100	80.4	3.92	6.7	1189	.	6.5
21JUL76	1430	28.3	100	100	60.8	2.28	6.2	1189	.	6.5
26JUL76	1000	24.0	100	100	83.8	1.44	6.5	1920	.	10.0
26JUL76	1500	14.4	100	100	88.9	2.35	6.7	1920	.	10.0
27JUL76	945	12.3	100	100	81.0	2.83	6.7	1064	.	5.0
28JUL76	1030	8.8	100	100	79.4	3.00	6.8	1335	.	.
28JUL76	1415	16.7	100	100	93.5	3.98	6.6	1335	.	6.5
09AUG76	1010	7.8	100	100	94.4	1.20	6.8	660	.	5.0
10AUG76	1600	14.8	100	100	85.0	9.56	6.1	814	.	4.0
11AUG76	945	17.3	100	100	91.0	8.08	5.8	2045	.	10.0
11AUG76	1545	10.0	100	100	90.1	6.82	6.5	2045	.	10.0
12AUG76	930	11.0	100	100	65.0	3.01	6.9	1523	.	9.0
12AUG76	1415	26.7	100	100	75.3	4.50	5.8	1523	.	9.0
16AUG76	945	11.0	100	100	88.9	3.51	6.4	.	.	.
16AUG76	1430	11.1	100	100	85.6	4.41	6.4	.	.	.
17AUG76	1015	16.8	100	100	88.4	3.68	6.5	1628	.	9.0
17AUG76	1445	16.7	100	100	93.6	3.98	6.2	1628	.	9.0
18AUG76	1000	24.1	100	100	86.5	3.98	6.6	1794	.	9.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
19JUL76	.	.	.	.	.	34	21	21	24	28	6.1
20JUL76	.	.	.	.	.	31	19	21	25	27	6.1
20JUL76	.	.	.	.	.	31	19	21	25	28	6.1
21JUL76	.	.	.	.	.	34	21	21	26	28	6.1
21JUL76	.	.	.	.	.	34	21	21	26	29	6.1
26JUL76	.	.	.	.	.	37	21	19	27	27	6.1
26JUL76	.	.	.	.	.	37	21	19	27	28	6.1
27JUL76	.	.	.	.	.	31	19	22	24	27	6.1
28JUL76	.	.	.	.	.	36	20	23	28	27	6.1
28JUL76	.	.	.	.	.	.	.	.	.	28	6.1
09AUG76	.	.	.	.	.	28	20	20	24	24	2.3
10AUG76	.	.	.	.	.	29	19	24	28	27	2.3
11AUG76	.	.	.	.	.	30	20	18	23	26	2.3
11AUG76	.	.	.	.	.	30	20	18	23	27	2.3
12AUG76	.	.	.	.	.	31	18	21	23	26	2.3
12AUG76	.	.	.	.	.	31	18	21	23	27	2.3
16AUG76	.	.	.	.	.	32	20	21	24	27	2.3
16AUG76	.	.	.	.	.	32	20	21	24	28	2.3
17AUG76	.	.	.	.	.	31	19	17	24	26	2.3
17AUG76	.	.	.	.	.	31	19	17	24	26	2.3
18AUG76	.	.	.	.	.	29	14	17	22	25	2.3

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
18AUG76	1430	19.1	100	100	89.9	3.07	6.4	1794	.	9.0
23AUG76	1000	32.8	100	100	80.7	6.09	5.8	1881	.	9.0
23AUG76	1445	39.1	100	100	75.1	5.02	5.4	1881	.	9.0
24AUG76	1010	49.4	100	100	78.2	3.93	5.9	1398	.	9.0
24AUG76	1430	31.7	100	100	83.7	1.43	5.8	1398	.	9.0
25AUG76	930	23.2	100	100	94.2	4.79	6.3	.	.	.
25AUG76	1500	17.4	100	100	95.4	3.76	5.5	.	.	.
30AUG76	1000	25.1	100	100	93.5	3.74	6.1	.	.	9.0
30AUG76	1430	48.5	100	100	88.2	5.42	5.3	.	.	9.0
31AUG76	945	49.5	100	100	87.5	7.35	5.3	1461	.	9.0
31AUG76	1445	26.6	100	100	83.4	5.14	5.5	1461	.	9.0
01SEP76	930	23.8	100	100	77.5	6.34	5.6	1586	.	9.0
01SEP76	1430	49.6	100	100	81.2	3.27	5.5	1586	.	9.0
07SEP76	930	22.8	100	100	79.1	5.83	6.4	1982	.	9.0
08SEP76	930	34.5	100	100	89.9	5.12	6.1	2066	.	9.0
08SEP76	1415	22.7	100	100	90.5	2.22	6.4	2066	.	9.0
09SEP76	930	31.2	100	100	83.3	5.93	5.7	.	.	.
09SEP76	1400	22.8	100	100	90.8	5.95	6.3	.	.	.
13SEP76	1000	21.0	100	100	85.7	4.95	6.2	1941	.	9.0
13SEP76	1430	18.8	100	100	90.6	6.55	6.1	1941	.	9.0
14SEP76	945	23.4	100	100	80.7	5.55	6.2	1941	.	9.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
18AUG76	.	.	.	.	.	29	14	17	22	25	2.3
23AUG76	.	.	.	.	.	32	18	22	28	24	4.3
23AUG76	.	.	.	.	.	32	18	22	28	26	4.3
24AUG76	.	.	.	.	.	32	20	23	28	26	4.3
24AUG76	.	.	.	.	.	32	20	23	28	28	4.3
25AUG76	.	.	.	.	.	31	20	23	26	26	4.3
25AUG76	.	.	.	.	.	31	20	23	26	28	4.3
30AUG76	.	.	.	.	.	33	19	16	21	25	4.3
30AUG76	.	.	.	.	.	33	19	16	21	26	4.3
31AUG76	.	.	.	.	.	29	16	14	19	24	4.3
31AUG76	.	.	.	.	.	29	16	14	19	25	4.3
01SEP76	.	.	.	.	.	28	12	18	21	25	0.0
01SEP76	.	.	.	.	.	28	12	18	21	26	0.0
07SEP76	.	.	.	.	.	31	17	16	18	23	0.5
08SEP76	.	.	.	.	.	28	18	14	18	22	0.5
08SEP76	.	.	.	.	.	28	18	14	18	23	0.5
09SEP76	.	.	.	.	.	29	19	16	19	23	0.5
09SEP76	.	.	.	.	.	29	19	16	19	25	0.5
13SEP76	.	.	.	.	.	29	11	14	20	22	3.0
13SEP76	.	.	.	.	.	29	11	14	20	25	3.0
14SEP76	.	.	.	.	.	29	10	16	19	22	3.0

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
14SEP76	1430	7.5	100	100	90.0	6.72	6.4	1941	.	9.0
15SEP76	930	24.5	100	100	91.2	5.43	5.6	1982	.	9.0
15SEP76	1415	21.1	100	100	90.9	2.36	5.4	1982	.	9.0
17SEP76	1400	30.4	100	100	84.2	6.09	6.3	1982	.	9.0
20SEP76	930	30.5	100	100	86.7	4.40	6.1	2188	.	9.0
20SEP76	1400	33.5	100	100	80.9	4.44	6.1	2188	.	9.0
21SEP76	1000	26.5	100	100	90.7	5.16	6.1	2253	.	9.0
21SEP76	1400	28.2	100	100	89.6	4.84	6.0	2253	.	9.0
22SEP76	945	43.9	100	100	80.2	4.66	6.3	1941	.	9.0
22SEP76	1445	40.2	100	100	82.3	4.97	6.3	1941	.	9.0
27SEP76	945	24.3	100	100	87.2	4.84	6.3	1941	.	9.0
27SEP76	1400	25.2	100	100	86.5	4.40	6.2	1941	.	9.0
28SEP76	930	20.5	100	100	90.4	5.05	5.8	2128	.	9.0
28SEP76	1400	19.2	100	100	82.2	3.86	6.2	2128	.	9.0
29SEP76	930	25.7	100	100	90.8	4.70	6.2	1982	.	9.0
29SEP76	1500	20.0	100	100	81.8	6.32	6.0	1982	.	9.0
04OCT76	930	13.2	100	100	90.3	8.67	5.9	2253	.	9.0
04OCT76	1500	17.7	100	100	91.0	8.62	5.9	2253	.	9.0
05OCT76	945	17.5	100	100	81.5	6.50	5.9	1982	.	9.0
05OCT76	1430	22.7	100	100	89.2	7.32	5.5	1982	.	9.0
06OCT76	945	12.2	100	100	81.6	3.03	6.3	2058	.	9.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
14SEP76	.	.	.	.	.	29	10	16	19	23	3.0
15SEP76	.	.	.	.	.	27	19	20	21	21	9.4
15SEP76	.	.	.	.	.	27	19	20	21	23	9.4
17SEP76	.	.	.	.	.	31	17	16	18	23	9.4
20SEP76	.	.	.	.	.	33	13	17	20	22	9.4
20SEP76	.	.	.	.	.	33	13	17	20	23	9.4
21SEP76	.	.	.	.	.	32	18	18	22	23	11.2
21SEP76	.	.	.	.	.	32	18	18	22	24	11.2
22SEP76	.	.	.	.	.	32	12	13	19	22	11.2
22SEP76	.	.	.	.	.	32	12	13	19	23	11.2
27SEP76	.	.	.	.	.	32	12	22	24	22	12.4
27SEP76	.	.	.	.	.	32	12	22	24	22	12.4
28SEP76	.	.	.	.	.	32	22	20	23	23	12.4
28SEP76	.	.	.	.	.	32	22	20	23	24	12.4
29SEP76	.	.	.	.	.	27	15	15	18	22	12.4
29SEP76	.	.	.	.	.	27	15	15	18	23	12.4
04OCT76	.	.	.	.	.	27	12	14	17	20	0.0
04OCT76	.	.	.	.	.	27	12	14	17	22	0.0
05OCT76	.	.	.	.	.	26	14	15	17	20	0.0
05OCT76	.	.	.	.	.	26	14	15	17	21	0.0
06OCT76	.	.	.	.	.	24	10	16	18	20	0.0

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
06OCT76	1400	13.6	100	100	89.6	4.36	6.5	2058	.	9.0
09OCT76	930	9.5	100	100	89.1	1.78	6.6	1857	.	9.0
09OCT76	1415	9.5	100	100	89.8	2.09	6.6	1857	.	9.0
12OCT76	930	25.8	100	100	76.4	1.76	6.3	2045	.	9.0
12OCT76	1400	19.3	100	100	71.0	1.10	6.4	2045	.	9.0
13OCT76	930	25.7	100	100	66.7	2.57	6.4	1961	.	9.0
13OCT76	1400	18.0	100	100	78.0	2.18	6.4	1961	.	9.0
18OCT76	1000	22.3	100	100	86.8	1.52	6.4	1899	.	9.0
18OCT76	1400	18.1	100	100	82.8	1.22	6.2	1899	.	9.0
19OCT76	930	11.0	100	100	87.2	.	.	1753	.	9.0
19OCT76	1400	24.5	100	100	76.6	3.31	6.3	1753	.	9.0
21OCT76	930	42.0	100	100	65.2	1.23	6.1	2316	.	9.0
21OCT76	1400	26.7	100	100	62.7	1.72	6.0	2316	.	9.0
25OCT76	930	32.6	100	100	50.9	1.17	6.3	1189	.	6.5
25OCT76	1400	30.1	100	100	73.5	3.68	6.2	1189	.	6.5
26OCT76	1030	33.2	100	100	67.0	2.52	6.3	1440	.	7.5
26OCT76	1400	12.9	100	100	72.5	3.63	6.3	1440	.	7.5
27OCT76	945	60.4	100	100	50.6	1.48	6.1	1878	.	9.0
27OCT76	1400	17.9	100	100	75.6	2.15	6.2	1878	.	9.0
01NOV76	945	10.6	100	100	84.9	3.63	6.6	1377	.	9.0
01NOV76	1430	13.1	100	100	73.9	1.86	6.5	1377	.	9.0

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
06OCT76	.	.	.	.	.	24	10	16	18	21	0.0
09OCT76	.	.	.	.	.	20	11	8	11	18	4.6
09OCT76	.	.	.	.	.	20	11	8	11	19	4.6
12OCT76	.	.	.	.	.	19	4	9	13	17	4.6
12OCT76	.	.	.	.	.	19	4	9	13	18	4.6
13OCT76	.	.	.	.	.	19	4	8	12	17	4.6
13OCT76	.	.	.	.	.	19	4	8	12	18	4.6
18OCT76	.	.	.	.	.	14	5	4	7	15	6.6
18OCT76	.	.	.	.	.	14	5	4	7	15	6.6
19OCT76	.	.	.	.	.	14	5	4	7	14	6.6
19OCT76	.	.	.	.	.	14	5	4	7	15	6.6
21OCT76	.	.	.	.	.	16	9	4	8	14	12.2
21OCT76	.	.	.	.	.	16	9	4	8	14	12.2
25OCT76	.	.	.	.	.	17	1	13	15	15	12.2
25OCT76	.	.	.	.	.	17	1	13	15	15	12.2
26OCT76	.	.	.	.	.	21	13	11	14	15	12.2
26OCT76	.	.	.	.	.	21	13	11	14	15	12.2
27OCT76	.	.	.	.	.	16	3	1	10	13	12.2
27OCT76	.	.	.	.	.	16	3	1	10	14	12.2
01NOV76	.	.	.	.	.	16	5	6	9	12	0.0
01NOV76	.	.	.	.	.	16	5	6	9	13	0.0

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
02NOV76	930	30.6	100	100	83.5	4.21	6.0	1920	.	9.0
02NOV76	1400	41.0	100	100	74.6	4.41	6.0	1920	.	9.0
03NOV76	930	13.5	100	100	83.2	7.76	6.2	1827	.	9.0
03NOV76	1400	17.7	100	100	66.3	3.42	4.2	1827	.	9.0
08NOV76	1000	32.8	100	100	55.1	1.38	6.2	1827	.	9.0
08NOV76	1400	14.4	100	100	81.2	3.75	6.3	1827	.	9.0
09NOV76	1000	25.6	100	100	71.6	2.32	6.4	1815	.	9.0
09NOV76	1400	21.4	100	100	57.6	1.32	6.1	1815	.	9.0
10NOV76	930	16.6	100	100	81.6	3.40	5.8	1481	.	9.0
10NOV76	1400	16.6	100	100	88.5	4.08	6.3	1481	.	9.0
16NOV76	930	7.0	100	100	92.5	6.61	6.2	1523	.	9.0
16NOV76	1400	7.2	100	100	84.4	3.30	5.8	1523	.	9.0
17NOV76	930	29.9	100	100	71.3	5.35	5.6	2024	.	9.0
17NOV76	1400	23.7	100	100	69.9	5.34	5.7	2024	.	9.0
18NOV76	930	22.8	100	100	89.0	8.32	4.7	1523	.	9.0
18NOV76	1400	14.5	100	100	89.8	5.01	4.8	1523	.	9.0
22NOV76	930	13.7	100	100	91.6	6.40	5.0	1189	.	7.5
22NOV76	1400	12.7	100	100	91.6	5.08	5.4	1189	.	7.5
23NOV76	1000	30.6	100	100	86.6	2.20	4.7	1273	.	9.5
13DEC76	1100	17.3	100	100	84.8	7.24	5.0	1419	.	7.5
13DEC76	1530	13.6	100	100	75.9	8.12	5.0	1419	.	7.5

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
02NOV76	.	.	.	.	.	14	-2	6	10	12	0.0
02NOV76	.	.	.	.	.	14	-2	6	10	13	0.0
03NOV76	.	.	.	.	.	17	-2	9	13	12	0.0
03NOV76	.	.	.	.	.	17	-2	9	13	13	0.0
08NOV76	.	.	.	.	.	16	2	0	4	10	0.0
08NOV76	.	.	.	.	.	16	2	0	4	10	0.0
09NOV76	.	.	.	.	.	6	-8	1	6	10	0.0
09NOV76	.	.	.	.	.	6	-8	1	6	10	0.0
10NOV76	.	.	.	.	.	12	4	4	8	9	0.0
10NOV76	.	.	.	.	.	12	4	4	8	10	0.0
16NOV76	.	.	.	.	.	4	0	2	3	9	6.1
16NOV76	.	.	.	.	.	4	0	2	3	9	6.1
17NOV76	.	.	.	.	.	9	1	3	5	9	6.1
17NOV76	.	.	.	.	.	9	1	3	5	9	6.1
18NOV76	.	.	.	.	.	11	-1	4	6	8	6.1
18NOV76	.	.	.	.	.	11	-1	4	6	9	6.1
22NOV76	.	.	.	.	.	16	-1	0	3	8	6.1
22NOV76	.	.	.	.	.	16	-1	0	3	9	6.1
23NOV76	.	.	.	.	.	8	-5	0	4	8	6.1
13DEC76	.	.	.	.	.	14	4	3	7	9	10.7
13DEC76	.	.	.	.	.	14	4	3	7	9	10.7

MINE=TEER_E

DATE	TIME	CONC	P10	P40	P200	RES	PH	ORE	WASH	HRS
14DEC76	945	14.1	100	100	80.8	5.73	5.1	1356	.	8.0
14DEC76	1430	8.9	100	100	85.6	2.70	5.3	1356	.	8.0
16DEC76	930	10.2	100	100	88.6	2.53	5.3	1315	.	8.0
16DEC76	1400	19.1	100	100	80.3	1.59	5.3	1315	.	8.0
20DEC76	1000	15.1	100	100	84.4	3.19	5.2	1356	.	8.0
20DEC76	1400	7.9	100	100	90.2	3.34	5.3	1356	.	8.0
21DEC76	930	9.3	100	100	89.5	2.93	5.4	.	.	.

DATE	S1	B1	S2	I2	B2	HT	LT	WB	DB	ST	RAIN
14DEC76	.	.	.	.	.	7	-3	-1	3	8	10.7
14DEC76	.	.	.	.	.	7	-3	-1	3	9	10.7
16DEC76	.	.	.	.	.	10	6	8	9	9	13.2
16DEC76	.	.	.	.	.	10	6	8	9	10	13.2
20DEC76	.	.	.	.	.	14	4	8	13	9	13.2
20DEC76	.	.	.	.	.	14	4	8	13	9	13.2
21DEC76	.	.	.	.	.	12	-3	-1	0	8	13.2